

SELECTED

SESOURCESRESOURCES ABSTRACTS



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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 5, NUMBER 20 OCTOBER 15, 1972

W72-11739 -- W72-12388

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Rioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

STRUCTURE OF WATER.

E. Forslind. Quarterly Reviews of Biophysics, Vol 4, No 4, p 325-363, 1971. 18 fig, 5 tab, 46 ref.

Descriptors: *Physicochemical properties, *Water chemistry, *Water structure, *Biological properties, Model studies, Theoretical analysis, Reviews, Hydrogen bonding, Molecular structure. Identifiers: *Monomers, *Lattices.

Reviewed are the structural properties of water that may throw some light on the molecular mechanism responsible for the appearance of the presumed anomalous behavior of the liquid. It is inferred that the anomalies could quite well be nor-mal. Some theoretical developments regarding the mal. Some theoretical developments regarding the water monomer structure and a comparison of experimental data are described. The problem of the double-well potential of the hydrogen bond and the association mechanism and the important theoretical verification of the hypothesis of cooperative bond reinforcement are discussed. A simple theory of the interstitial model of the water structure is described and numerically evaluated on the heart of exercimental density date. This on the basis of experimental density data. This serves to introduce several anomalies appearing as discontinuities in the graphs describing theoretical parameters. A comparison is made with recent experimental findings from Raman spectra which seem to agree in considerable detail with the density data. ty data producing the anomalies. Some additional experimental anomalies are reviewed and compared with the theory. Although todays knowledge tends to favor the model of the defect lattice with stepwise thermal breakdown and structure stabilization by means of an interstitial non-as-sociated phase, unclarified problems remain. (Casey-Arizona) W72-12372

1B. Aqueous Solutions and Suspensions

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

Resources Center.
R. A. Pierotti, and A. A. Liabastre.
Available from the National Technical Information Service as PB-211 163, \$3.00 in paper copy, \$0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Report ERC-0572, June 1972. 102 p, 24 fig, 28 tab, 50 ref, 2 append. OWRR A-017-GA (1).

Descriptors: *Aqueous solutions, *Water proper-ties, *Water structure, *Solutes, *Organic com-pounds, Solubility, Water, Heavy water, Solvents, Energy transfer, Thermodynamics, Enthalpy, Gas chromatography, Molecular structure.

The objective was to separate the interaction of the solute with water into the solute-water interaction and the solute-solute interaction in the presence of water. The solubility of benzene, toluene, n-pentance, cyclopentane, cyclohexane, cyclopentene, cyclohexene, 1,4-cyclohexadiene and cycloheptatriene in H2O and D2O were measured using gas-liquid chromatographic techniques over the temperature range of 278 to 318 degrees K. This solubility data were used to compute Henry Law constants and from the temperature dependence of the Henry Law constants, the thermodynamic changes associated with the solution process were calculated. These thermodynamic properties were compared for the water and D2O solutions in terms of the transfer of solute from

H2O to D2O. Free energies, enthalpies and heat capacities of transfer were determined as a func-tion of temperature. Theoretical interpretations of the temperature. Incorretical interpretations of temperature. Incorretical interpretations of the molecular properties of the solute and solvent were investigated also. The scaled particle theory of solutions was used to obtain effective 'core diameters' and effective dispersion energy parameters for non-spherical solutes and solvents. This theory is adaptable to the study of the solubility of water increanic solvents as well as to the solubility of ororganic solvents as well as to the solubility of or-ganic substances in water. (Conway-Ga. Tech)

02. WATER CYCLE

2A. General

A RAINFALL-RUNOFF SIMULATION MODEL FOR ESTIMATION OF FLOOD PEAKS FOR SMALL DRAINAGE BASINS,

SMALL DRAILAGE BASINS, Geological Survey, Washington, D.C. D.R. Dawdy, R. W. Lichty, and J. M. Bergmann. Available from GPO, Washington, D. C. 20402, Price 40 cents (paper cover). Geological Survey Professional Paper 506-B, 1972. 28 p, 15 fig, 12 12b, 23 ce⁶

Descriptors: *Mathematical models, *Parametric hydrology, *Peak discharge, *Simulation analysis, *Small watersheds, Urban hydrology, Storm runoff, Flood forecasting, Model studies, Computer models, Rainfall-runoff relationships.

A parametric rainfall-runoff simulation model may A parametric rainfall-runoff simulation model may be used with data from a point rainfall gage and data on daily potential evapotranspiration to predict flood volume and peak rates of runoff for small drainage areas. The model is based on bulk-parameter approximations to the physical laws governing infiltraztion, soil-moisture accretion and depletion, and surface streamflow. Three case studies are presented in which an objective fitting method is used for determining certimal best-fit method is used for determining optimal best-fit sets of parameter values for the data available for use in predicting flood peaks. Errors of prediction result both from errors in rainfall input and from lack of model equivalence to the physical prototype. These two sources of error seem to be of the same order of magnitude for a model of the level of simplicity of that presented. Major gains in ac-curacy of simulation will require improvements in both data and model. The limit of accuracy of prediction of flood peaks by simulation with a bulk-parameter model using data obtained from a single rain gage seems to be on the order of 25 percent. The effect of man-made changes on a basin can be related to changes in model parameters, so that measured 'before' conditions can be compared with simulated 'after' conditions of sufficient ac-curacy for planning purposes. (Knapp-USGS) W72-11754

SALINITY AND THE HYDROLOGIC CYCLE, Flinders Univ., Bedford Park (Australia). School of Physical Sciences. For primary bibliographic entry see Field 03C. W72-11757

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII). Nauchno-Issledovatelskii Sredneaziatskii Gidrometeorologicheskii Institut, Tashkent

For primary bibliographic entry see Field 02C. W72-11773

GLACIOLOGICAL INVESTIGATIONS ON THE ABRAMOVA GLACIER IN ACCORDANCE

WITH THE PROGRAM OF THE INTERNA-TIONAL HYDROLOGICAL DECADE (GLYAT-SIOLOGICHESKIYE ISSLEDOVANIYA PO PROGRAMME MEZHDUNARODNOGO GIDROLOGICHESAUGO, LEDNIKE AB RAMOVA), Nauchno-Issledovatelskii Tashkent GIDROLOGICHESKOGO DESYATILETIYA NA Gidrometeorologischeskii Institut,

For primary bibliographic entry see Field 02C. W72-11774

ADEQUACY OF HYDROLOGIC RECORDS FOR PARAMETER ESTIMATION, Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 07C.
W72-11991

VARIATIONS IN MINIMUM RUNOFF FROM SMALL BASINS (ALIVALUMAN VAIH-TELUISTA PIENILLA ALUEILLA), Vesientutkimuslaitos, Vesihallitus, Helsinki (Fin-For primary bibliographic entry see Field 02E. W72-12021

HYDRAULIC MODEL TEST ON THE DIFFU-SION OF INDUSTRIAL WASTE-WATER IN THE SEA, Mitsubishi Heavy Inudstries Ltd., Kobe (Japan). For primary bibliographic entry see Field 05B. W72-12081

CAMP STREAM IHD EXPERIMENTAL BASIN NO. 12, Ministry of Works, Wellington (New Zealand). Water and Soil Div. For primary bibliographic entry see Field 02E. W72-12374

MODEL HYDROGRAPHS, Geological Survey, Washington, D.C. W. D. Mitchell.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price \$0.45. Geological Survey Water-Supply Paper 2005, 1972. 85 p, 16 fig, 36 tab, 5 ref.

Descriptors: *Model studies, *Hydrographs, *Watersheds (Basins), *Hydrology, *Rainfall-ru-noff relationships, Streamflow forecasting, Hydrologic data, Watershed management, Mathe-matical studies, Correlation analysis.

An array of model hydrographs is presented with explanations of their development, their use, and their relation to unit hydrographs. Model hydrographs are developed from a dimensionless translation hydrograph, having a time base of T hours and appropriately modified for storm duration by routing through reservoir storage. Models fall into two distinct classes: (1) those for which the value of x (exponent in the relation between storage and of x (exponent in the relation between storage and outflow) is unity and which have all the characoutflow) is unity and which have all the characteristics of true unit hydrographs and (2) those for which the value of x is other than unity and to which the unit-hydrograph principles of proportionality and superposition do not apply. Twenty-six families of linear models and eight families of nonlinear models in tabular form comprise the principal subject of this report. Supplemental discussions describe the development of the models and illustrate their application. Methods of determining the hydrograph characteristics, both from observed hydrographs and from the physical characteristics of the drainage basin, are described. Five illustrative examples show that the models, when properly converted to incorporate actual rainfall excess and the time and areal

Field 02—WATER CYCLE

Group 2A-General

characteristics of the drainage basins, satisfactorily represent the observed flood hydrographs for the basins. (Woodard-USGS) W72-12376

2B. Precipitation

A CAPACITOR-TYPE RAIN GAUGE WITH DC OUTPUT AND IMPROVED FLOW CHARACTERISTICS,

Bell Telephone Labs., Inc., Holmdel, N.J. Craw-R. R. Seibel

Review of Scientific Instruments, Vol 43, No 8, p 1081-1085, August 1972. 8 fig, 1 ref.

Descriptors: *Rain gages, *Instrumentation, Monitoring, Flowmeters, Flow measurement, Gages, Rainfall.

A rain gage for continuously measuring rainfall rates in the range 0-800 mm/h is described. The collected rain water is channeled to flow through a capacitor which constitutes one arm of an RC bridge. The a.c. voltage across the bridge is processed to give a d.c. output which is nearly linearly proportional to rainfall rate. Low as well as high rain rates can be measured accurately. The output incorporates a time constant which can be switched into smooth fluctuations in rain rate. (Knapp-USGS) W72-11748

METEOROLOGICAL CONDITIONS AND MEA-METEOROLOGICAL CONDITIONS ASSUREMENT OF ABLATION ON THE GLACIER (METEOROLOGICHESKIYE USLOVIYA RASCHET ABRAMOVA), Sredneaziatskii TAYANIYA NA

Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, (USSR).

For primary bibliographic entry see Field 02C. W72-11776

SYNOPSIS OF THE METEOROLOGICAL OB-SERVATIONS AT MELLE: AVERAGES 1962-

Ghet Rijksuniversiteit (Belgium).

T. Behaeghe, and J. Traets. Meded Fac Landbouwwet Rijksuniv Gent. Vol 35 Meded Fac Landbouwwei Rijksulli Voll.
No 4 p 991-997, 1970. Illus. English summary.

Mantifiers: Averages. *Melle (Belgium), Identifiers: Identifiers: Averages, *N
*Meteorological data, Synopsis.

From the begining of 1962 detailed meteorological observations were carried out on the experimental farm at Melle. The averages obtained during the period 1962-1969 are presented graphically. The system used was that of the 3-decade floating mean.--Copyright 1972, Biological Abstracts, Inc. W72-11815

WATER RESOURCE OBSERVATORY CLI-MATOLOGICAL DATA - WATER YEAR 1971. Wyoming Univ., Laramie. Water Resources Research Inst. For primary bibliographic entry see Field 07C.

FACTORS CONTRIBUTING TO UNUSUALLY LOW RUNOFF DURING THE PERIOD 1962-68 IN THE CONCHO RIVER BASIN, TEXAS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02E. W72-11987

THE PRECIPITATION MEASUREMENT PARADOX-THE INSTRUMENT ACCURACY PROBLEM,

World Meteorological Organization Reports on WMO/IHD Projects, Report No 16, Contribution to International Hydrological Decade (IHD), 1971. 42 p, 13 fig, 62 ref.

Descriptors: *Rain gages, *Precipitation gages, *Calibrations, *Instrumentation, Gaging stations, Measurement, Data collections, Basic data collections, International Hydrological Decade.

There is no means of assessing the accuracy of the gages comprising the bulk of most national raingage networks—the so-called 'standard' gages. The problems of measuring precipitation at a point are discussed. Particular attention is given to the performance of the commonly used elevated type performance of the commonly used elevated type of raingage compared with measurements made by instruments installed with their rims at ground level. Studies of the behavior of pit gages and their relation to the national 'standard' gage are currently underway in a number of countries. These include Denmark, Hungary, Kenya, Netherlands, Sweden, United Kingdom, United States, and U.S.S.R. In addition to studies of the influence of wind in secrecation. wind on gage catch, the effect of wind in evaporat-ing the collected rain has also been investigated. (Knapp-USGS) W72-12032

ON THE ACCURACY OF ESTIMATING AVERAGES OVER GEOGRAPHIC AREAS, R. Czelnai.

Available from NTIS, Springfield, Va 22151 as AD-733 808, Price: \$3.00 paper copy; 95 cents microfiche. Air Force Systems Command Foreign Technology Division Edited Translation Report FTD-HC-23-815-71, August 1971. 16 p, 9 fig, 3 tab, 7 ref. Originally published in Idojaras (Weather), Vol 73, No 6, p 340-350, 1969.

Descriptors: *Meteorology, *Weather data, *Rainfall, *Average runoff, *Estimating, Methodology, Stochastic processes, Mathematical studies, Equations, Geographical regions, Forecasting. Identifiers: Probable errors.

A method for determining the probable errors of calculated area averages of meteorological elements is presented. By using the structural function of the stochastic field of the investigated element, the probable error of the estimated area average is expressed in functions of network density and that of the respective area of averaging. The method is demonstrated by calculations concerning the accuracy of estimated area average rainfall depth. (Woodard-USGS) W72-12034

WILL THE ARIZONA DROUGHT OF 1971 OCCUR AGAIN., Arizona Univ., Tucson. Dept. of Geography and

Arizona Univ., Ticson. Dept. of Geography Area Development. D. Steila, and R. Gelpke. Arizona Review, Vol. 21, No. 6-7, p 9-14, 1972.

Descriptors: *Arizona, *Droughts, *Probability, Precipitation (Atmospheric), Rainfall, Arid cli-mates, Southwest U.S., Seasonal, Moisture deficit.

Drought is differentiated from aridity. Based on monthly precipitation data since 1931, it was determined that all seven of Arizona's climatic divisions suffered drought in 1971. Maps show the probability of mild and moderate droughts and severe and extreme droughts in each climatic division of Arizona. The suphwest and south central sion of Arizona. The southwest and south central divisions have the greatest chance of mild to moderate drought status. The northern half of the state is most prone to intense droughts. (Sherbrooke-Arizona) W72-12356

BAJA CALIFORNIA'S CLIMATE, Fresno State Coll., Calif. School of Social Science.

Weatherwise, Vol 25, No 2, p 64-76, April 1972.

Descriptors: *Climatology, *Precipitation (Atmospheric), *Climatic data, *Mexico, *Weather patterns, Distribution patterns, Rainfall, Temperature, Seasonal, Regional analysis, Isohyets, Cloudbursts, Storms, Droughts, Dry seasons, Fog, Orography, Arid lands, Semiarid climates. Identifiers: *Baja (Calif).

Data from a network of 120 stations of a cooperative weather observation program allow the con-struction of meteorological isopleths on maps of Baja California and a more detailed analysis of weather phenomena than previously possible. Mean annual rainfall places the entire peninsula in either arid or semi-arid of the Koppen system. In the north rain shadows occur on both sides of the mountains, changing with season and direction of moisture source. Deluge rainfall from hurricanes is important in the south and Gulf Coast and in these areas the median annual rainfall would be a better measure of normal rainfall than the mean. The central Pacific coast is subjected to heavy fogs, where seasonality is strong under the west Coast Regime (Ensenada), there is very little summer rain. Where seasonality is strong under the Tropi-cal Regime (Cabo San Lucas), there is very little winter rain. Seasonality of temperature changes is discussed. (Sherbrooke-Arizona) W72-12360

2C. Snow, Ice, and Frost

GEOCHEMISTRY OF MELTWATER STREAMS FROM NINE ALASKAN GLACIERS, Memorial Univ. of Newfoundland, St. John's.

Dept. of Geology. R. M. Slatt.

Geological Society of America Bulletin, Vol 83, p 1125-1132, April 1972. 3 fig, 2 tab, 31 ref.

Descriptors: *Water chemistry, *Melt water, *Glaciers, *Alaska, Glaciohydrology, Geochemistry, Sampling, Water analysis, Suspended load, Leaching.

Melt-water streams from nine Alaskan valley glaciers eroding five different bedrock types were analyzed. The streams are similar in that Ca is the most abundant ion and the cold waters have abasic pH. Total (Na + K + Mg + Si) and suspended load concentrations vary in streams from glaciers on different bedrock types, from different glaciers on similar bedrock, and from the same glaciers during different sampling periods. Bedrock type is probably not the most important factor controlling the quantity of total (Na + K + Ca + Mg + Si) in glacial melt water, and suspended load concentration is controlled by stream conditions at the time of sampling. Ions are introduced to melt water by partial dissolution of suspended load and more Ca than other ions is in-troduced in this manner. (Knapp-USGS) W72-11751

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut,

Nauchno-Issledovatel'skiy Sredneaziatskiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), V. L. Shul'ts, and V. F. Suslov, editors, 1970. 136 p.

Descriptors: *Glaciers. *Glaciology, Glaciohydrology, Gorgraphy, Mountains, Elevation, River basins, Geomorphology, Meteorology, Snow, Snowpacks, Firn, Ice, Avalanches, Glacial drift, Mass wasting, Ablation, Melt water, Runoff, International Hydrological

Snow, Ice, and Frost—Group 2C

Identifiers: *USSR, *Soviet Central Asia, *Kirgiz SSR, *Glacier mass balance, *Glacier wastage, Glacier runoff, Glacier tongues, Snow avalanches, Snow line, Firn line.

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ogy,

ogy, Ice, This collection of 15 papers presents the results of investigations conducted on the Abramova Glacier in southwest Kirgiz SSR in accordance with the program of the International Hydrological Decade. A number of papers deal with glaciers in different parts of Soviet Central Asia and with glacier runoff and its role in mountain streamflow. Specific topics examined include: (1) modern glaciers in the Koksu River basin; (2) meteorological conditions and measurement of ablation on the Abramova Glacier; (3) water regime of the Koksu River; (4) natural contamination of snow cover and formation of snowpacks in the Abramova Glacier basin;
(5) mass balance of the Bol'shoy snowpack in the (5) mass balance of the Bol'shoy snowpack in the Chimganka River basin; (6) hydrologic regime of glaciers on the Alay Mountain range; (7) flood-waters in the Amu-Dar'ya River basin; (8) modern glaciers in the Sokh River basin; (9) ice melting under moraine cover; and (10) snow distribution and measurement of ablation on test plots. The text is intended to serve glaciologists, hydrologists, geophysicists, and geographers, as well as researchers and students at hydrometeorological institutes. (See W72-11774 thru W72-11782) (Josefw72-11773

GLACIOLOGICAL INVESTIGATIONS ON THE ABRAMOVA GLACIER IN ACCORDANCE WITH THE PROGRAM OF THE INTERNA-TIONAL HYDROLOGICAL DECADE (GLYAT-SIOLOGICHESKIYE ISSLEDOVANIYA PO PROGRAMME MEZHDUNARODNOGO PROGRAMME MEZHDUNARODNOGO GIDROLOGICHESKOGO DESYATILETIYA NA

LEDNIKE AB RAMOVA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologischeskii Institut, Tashkent

(USSR). Yu. N. Yemel'yanov.

In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovateľ skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 3-10, 1970. 3 fig, 6 ref.

Descriptors: *International Hydrological Decade, *Glaciology, *Glaciers, Ablation, Melting, Runoff, Msss wasting, Avalanches, Snowpacks, Snow cover, Firn, Ice, Water equivalent, Winds, Radiation, Elevation, Seasonal.

Identifiers: USSR, *Soviet Central Asia, *Kirgiz

SSR, *Alay Mountains, *Glacier mass balance, Glacier wastage, Snow avalanches, Firn line.

Like most glaciers of the Alay Mountain system in southwest Kirgiz SSR, the Abramova Glacier, covering 22.8 sq km, is in a stage of long-period shrinkage. In 1895-1967 the glacier diminished in size by 1,500 m, with the diminution in 1954-67 being 500 m. Length of the ablation season on the glacier ranges from 60 days in the accumulation zone to 120 days in the ablation zone. During the 1968 ablation season, the water equivalent of snow and ice at an elevation of 3,750 m was 5,600 mm and at elevations of 3,850 m and 3,950 m-3,000 mm and 1,500 mm, respectively. Total annual rumm and 1,300 mm, respectively. Total annual ru-noff from the basin of the Abramova Glacier in 1968 was 69.4 million cu m and in 1969, 58.8 million cu m. Average annual runoff for 1969 was 24.9 liter/sec/sq km and during the 1969 ablation season, it was 65.8 liter/sec/sq km. The vast amount of glaciological work conducted on the Abramova Glacier to determine the relation of glacial processes to both climatic change and streamflow reflects the basic objectives of the International Hydrological Decade for developing international research in hydrology. (See also W72-11773) (Josefson-USGS)

DATA ON MODERN GLACIERS IN THE KOKSU RIVER BASIN (NEKOTORYYE DAN-NYYE O SOVREMENNOM OLEDENENII BAS-SEYNA R. KOKSU),

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

(USSR).
V. F. Suslov, and L. D. Podkopayeva.
In: Voprosy glyatsiologii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 56
(71), p 11-15, 1970. 1 fig. 4 tab.

Descriptors: *Glaciers, *Glaciology, *River basins, Geomorphology, Topography, Cirques, Ice, Glacial drift, Mass wasting, Elevation. Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Koksu River, Glacial geomorphology, Val-ley glaciers, Corrie glaciers, Hanging glaciers, Firn

Tabulation of new data on modern glaciers in the Koksu River basin in southwest Kirgiz SSR was based on aerial photographs and large-scale maps. The total number of glaciers in the basin is 73, and The total number of glaciers in the basin is 73, and the total glacier area is 81.5 sq km, which is 23% of the entire glaciated region of the southern slope of the Alay Mountain range or 15.6% of the glacierized area of the Kyzylsu River basin. Glaciers in the Koksu River basin range in size from 0.1 sq km to 22.8 sq km. The number of glaciers larger than 0.1 sq km and smaller than 1.0 sq km is 44. The number of glaciers larger than 1 sq km is 15 and includes the Abramova, Alaudin, and Livenskov Glaciers. Most of the glaciers (94.5%) Livenskoy Glaciers. Most of the glaciers (94.5%) occur at elevations ranging from 3,800 to 4,600 m, with 3.6% found at elevations above 4,600 m and only 1.9% at elevations below 3,800 m. The area of greatest glacier development is around the upper reaches of the Koksu River and coincides with the location of the Abramova Glacier system. Valley glaciers are the most common type of glacier and account for over 45% of all glaciers and for over 80% of the total glacierized area. Glaciers in the Koksu River basin are wasting away, as evidenced by the presence of moraine deposits at the termini of modern glaciers by the occurrence of corrie and cirque forms of glacial relief. (See also W72-11773) (Josefson-USGS) W72-11775

METEOROLOGICAL CONDITIONS AND MEASUREMENT OF ABLATION ON THE THE GLACIER ABRAMOVA (METEOROLOGICHESKIYE USLOVIYA RASCHET TAYANIYA NA LEDNI LEDNIKE ABRAMOVA),

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

Z. A. Gerasimova.

In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 16-24, 1970. 2 fig. 7 tab, 7 ref.

Descriptors: "Glaciers, "Glaciology, "Meteorology, "Ablation, Melting, Melt water, Ice, Heat balance, Air temperature, Humidity, Radiation, Albedo, Cloud cover, Winds, Synoptic analysis. Identifiers: USSR, "Soviet Central Asia, "Kirgiz SSR, Radiation budget.

Climatic and radiation characteristics of the 1968 ablation season on the Abramova Glacier in southwest Kirgiz SSR are examined. Total solar southwest Kirgiz SSR are examined. Total solar radiation in July-August was considerable and under clear skies varied between 1.59 cal/sq cm/min and 1.71 cal/sq cm/min. Daily totals ranged from 316 cal/sq cm under cloudy skies to 8.13 cal/sq cm on clear days. Average daily total solar radiation for the period of observations was 687 cal/sq cm. Albedo of the glacier under clear skies varied between 0.44 and 0.11. The average radiation value for July was 431 cal/sq cm/day and that for August-250 cal/sq cm/day. Daily totals of

heat and moisture fluxes computed for 0.5-2.0 m-and 0.0-0.25 m-thick ice layers differed from rod measurement values of daily ice melting by the amount of refreezing melt water. (See also W72-11773) (Josefson-USGS) W72-11776

WATER REGIME OF THE KOKSU RIVER (VODNYY REZHIM R. KOKSU), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (IISSR)

A. A. Akbarov, and V. A. Neupokoyev.

In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 25-36, 1970. 5 fig. 3 tab, 6 ref.

Descriptors: *Glaciohydrology, *Water balance, *Water levels, *Discharge (Water), Stage-discharge relations, Runoff, Floodwater, Low flow, Ablation, Melting, Melt water, Water sources, Ice, Snow, Precipitation (Atmospheric), Radiation, Air temperature, Seasonal, Headwaters, International Hydrological Decade. Identifiers: USSR, *Soviet Central Asia, *Koksu River, *Glacier runoff, Glacier tongues, Snow line.

Investigations of water levels and precipitation at the headwaters of the Koksu River in 1967-69 were based on observations conducted according to the program of the International Hydrological Decade and on hydrologic studies carried out by the Kirgiz State Institute for the Planning of Water Economy in 1961-62. The hydrologic regime of the Koksu River is similar to that of many rivers which have their origin in glaciers. The maximum water level in 1968 was 158 cm and in 1969, 146 cm. Maximum in 1968 was 158 cm and in 1969, 146 cm. Maximum average daily discharges in 1968 were observed in the middle of August and totaled 12.6 cu m/sec. Maximum average daily discharges in 1969 ocurred at the end of July and in the middle of August and amounted to 12.8 cu m/sec and 10.7 cu m/sec, respectively. Water discharges at the beginning of the ablation season were samll and varied between 1 and 2 cu m/sec. During intensive realting of ice water discharges reached 12 cu melting of ice, water discharges reached 12 cu m/sec. During the 1968 ablation season, the runoff volume was 61.6 million cu m and in 1969 it was 54.9 million cu m. In 1968, the maximum amount of monthly runoff (33.7% of annual runoff) occurred in August, of which 87.9% was floodwater and 12.1% low flow. Average annual runoff of the Koksu River in 1968 and 1969 was 38.6 and 24.9 liter/sec/sq km, respectively. (See also W72-11773) (Josefson-USGS)

NATURAL CONTAMINATION OF SNOW COVER IN THE BASIN OF THE ABRAMOVA COVER IN THE BASIN OF THE ABRAMOVA
GLACIER (O YESTESTVENNOY ZAGRYAZNENNOSTI SNEZHNOGO POKROVA V BASSEYNE LEDNIKA ABRAMOVA),
Sredneziatskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tashkent

Oddrometeorologicheskii Institut, Tashkeni (USSR). V. K. Nozdryukhin. In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 37-42, 1970. 2 tab.

Descriptors: *Glaciers, *Snow, *Firn, *Dusts, *Air pollution effects, Mountains, Orography, Elevation, Summer, Sampling.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR. Snow avalanches.

The basin of the Abramova Glacier in southwest Kirgiz SSR was investigated in the summer of 1969 for dust content in the upper layer of snow and firm. A gradual increase in snow-surface con-tamination of the glacier was observed in the period between the beginning of summer and end

Field 02-WATER CYCLE

Group 2C—Snow, Ice, and Frost

of August. At the end of June, the average amount of dust deposited on 1 sq km of glacier surface was 2.45 metric tons, increasing by the end of July and August to 6.37 and 10.73 metric tons, respectively. The amount of dust added to the 22.76 sq km glacier surface during the summer was 244.2 metric tons. Data are given on the altitudinal extent of snow-surface contamination for elevations ranging from 3,800 to 4,600 m. (See also W72-11773) (Josefson-USGS) W72-11778

FORMATION OF SNOWPACKS IN THE BASIN OF THE ABRAMOVA GLACIER (FORMIROVANIYE NAVEYANNYKH SNEZHNIKOV V BASSEVNE LEDNIKA ABRAMOVA), Sredneaziatski Nauchno-Issledovatelskii

Sredneaziatski 1 Gidrometeorologicheskii Institut.

(USSN).
Yu. N. Yemel'yanov, and S. N. Temnikov.
In: Voprosy glyatsiologii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 56
(71), p 43-52, 1970. 4 fig, 3 tab, 4 ref.

Descriptors: *Glaciers, *Snowpacks, *Snow, *Winds, Wind velocity, Meteorology, Precipitation (Atmospheric), Air temperature, Radiation, Albedo, Density stratification, Glacial drift, Avalanches, Seasonal, Computers. Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Glacier mass balance, Snow avalanches, Snow density.

Transport of a large amount of wind-driven snow and formation of snowpacks play an important role in mass balance of the Abramova Glacier in southwest Kirgiz SSR. A snowpack on an ancient moraine 300 m from a research base built on the glacier was investigated in October 1967-May 1968. Total length of the snowpack during the period of observations was 350 m, average width was 45-50 m, and total area and volume were 12,000 sq m and 60,000 cu m, respectively. Formation of snowpacks in the region of the Abramova Glacier is determined by precipitation and wind velocity. During the winter, the total amount of snow transported across the snowpack surface was 30,000 metric tons, 73% of which was deposited. Average rate of transport of winddriven snow in the region of the glacier is 0.175 g/sq cm/min. (See also W72-11773) (Josefson-USGS) W72-11779

HYDROLOGIC REGIME OF GLACIERS OF THE ALAY MOUNTAIN RANGE
(GIDROLOGICHESKIY REZHIM LEDNIKOV
ALAYSKOGO KHREBTA),
Sredneaziatskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tashkent

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(USSR).
V. F. Suslov, and A. A. Akbarov.
In: Voprosy glyatsiologii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 56
(71), p 56-69, 1970. 5 fig. 4 tab, 14 ref.

Descriptors: *Glaciology, *Glaciers, *Hydrologic budget, *Orography, *Mountains, River basins, Slopes, Elevation, Meteorology, Air temperature, Radiation, Precipitation (Atmospheric), Snow, Firn, Ice, Ablation, Melting, Mass wasting, Streamflow, Runoff, Seasonal. Steamhow, whoth, soviet Central Asia, *Kirgiz SSR, *Alay Mountains, *Glacier runoff, Glacier tongues, Seasonal snow cover, Snow line, Firm

line. Firn fields. The role of the Bakalak, Raygorodskogo, and

Abramova Glaciers in streamflow of the Alay Mountain range in southwest Kirgiz SSR was in-vestigated in 1963-68. The total number of glaciers of the range is 1,119, and the total glacier area is 985.3 sq km. The total volume of water in the

glaciers is estimated to be 35 cu km, which is only 4 cu km less than the water content in glaciers of the central Caucasus. Glaciers of the Alay Mountain range are characterized by gradual shrinkage in an easterly direction and by slight increase in average elevations of the glaciers' lower limit and firm line. Average elevation of the lower limit of glaciers on the northern slope of the Alay Mountains is 3,970 m, and the firm-limit elevation is 4,180 m. On the southern slope these values are 4,000 m and 4,300 m, respectively. Average total runoff from the glaciers in summer is 34.4% of the annual runoff and varies in individual basins between 24.5% and 48.3%. Runoff from glacierized areas is 20.2% of the total annual ru-Runoff from noff of rivers of the mountain range. (See also W72-11773) (Josefson-USGS)

MODERN GLACIERS IN THE SOKH RIVER BASIN (SOVREMENNOYE OLEDENENIYE BASSEYNA R. SOKH),

Gidrometeorologicheskii Nauchno-Issledovatelsii (USSR). (USSR). A. S. Shchetinnikov.

A. S. Sichetumkov.
In: Voprosy glyatsiologii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 56
(71), p 80-91, 1970. 3 tab, 19 ref.

Descriptors: *Glaciology, *Glaciers, *River basins, *Geomorphology, Topography, Orography, Elevation, Precipitation (Atmospheric), Snow, Firn, Ice, Ablation, Melting, Melt water, Runoff, Mass wasting, Glacial drift, Seasonal. Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Sokh River, *Glacier runoff, Glacier mass balanace, Glacier wastage, Glacier tongues, Firn line, Firn fields line. Firn fields.

According to 1968 figures, the total number of glaciers in the Sokh River basin in southwest Kirgiz SSR is 276, and the total glacier area is 258.7 sq km. The number of glaciers larger than 0.1 sq km is 265 and covers 258.2 sq km. The glaciers exist in a wide variety of forms and characteristics. Corrie glaciers are the most common type of glacier and cover 43.4% of the glacierized area, followed by valley glaciers which comprise 29.4% or almost one-third of all glaciers. Average elevation of the glaciers' lower limit is 3,900 m and average elevation of the upper limit is 4,512 m. Most glaciers (76.5%) terminate at elevations of 3.501.4.500 m. (76.5%) terminate at elevations of 3,501-4,500 m, with only a small percentage (5.3%) terminating at an elevation of 3,000 m or less. About 68% of all glaciers occur at elevations of 3,800.4,600 m. Average height of the firn line is 4,100 m and varies in individual basins between 3,300 m and 4,500 m. Glacier runoff of the Sokh River is 30.2% of the annual runoff and 49.5% of the runoff for July-September. Runoff from glacier tongues is 74% and runoff from firn fields is 26% of the total glacier runoff. Average annual glacier runoff is 49.0 liter/sec/sq km. (See also W72-11773) (Josefson-W72-11781

CHANGES IN RADIATION BUDGET ON A MORAINE-COVERED ICE SURFACE (NEKO-TORYYE VOPROSY IZMENENIY RADIAT-SIONNOGO BALANSA NA ZAMORENENNOY SIONNOGO BALANDA,
POVERKINOSTI L'DA),
Nauchno-Issledovatelskii
Nauchno-Issledovatelskii
Tashkent

Gidrometeorologicheskii (USSR). Institut,

A. A. Tikhanovskaya.

In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 92-96, 1970. 2 fig., 5 ref.

Descriptors: *Glaciology, *Glaciers, *Glacial drift, *Ice, *Radiation, Albedo, Elevation, Equations. Identifiers: USSR.

Changes in radiation from an ice surface covered by a thin layer of moraine are investigated. The op-timal area covered by moraine is defined as the area which produces maximum increase in radiation and depends on the ratio of total solar radiation to increased losses to long-wave radiation and albedo of the moraine surface. The optimal area increases with increase in glacier elevation and with decrease in size of individual moraine particles. When increased losses to radiation from a unit area of moraine cover are less than increased absorption caused by changes in albedo of the surface, radiation from moraine-covered ice will exceed radiation from clean ice. (See also W72-11773) (Josefson-USGS)

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN-DOMINATED SUBARCTIC SURFACES, McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-11885

A THEORETICAL AND EXPERIMENTAL STUDY OF CLIMBING-RIPPLE CROSS-LAMINATION, WITH A FIELD APPLICATION TO THE UPPSALA ESKER, Uppsala Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 02J.

DEBRIS FALLS AT THE FRONT OF ARAPAHO ROCK GLACIER, COLORADO FROI RANGE, U.S.A., Ohio State Univ., Columbus. Dept. of Geology. For primary bibliographic entry see Field 02J. W72-11980

ICE CORED MOUNDS AND PATTERNED GROUND, SOUTHERN BANKS ISLAND, WESTERN CANADIAN ARCTIC, Ottawa Univ. (Ontario). Dept. of Geography H. M. French. Geografiska Annaler, Vol 53A, No 1, p 32-38, 1971. 5 fig, 1 tab, 23 ref.

Descriptors: *Permafrost, *Canada, Frozen soils, Arctic, Frost heaving, Ice, Cryology, Soil mechanics, Freezing, Thawing.
Identifiers: *Pingos, *Banks Island (Canada).

Small hydrolaccoliths (ice-cored mounds occur within low ice wedge polygons on poorly drained meadow tundra) soils in the Masik Valley, Banks Island, Canada. It is suggested that the process of ice segregation is brought about by a contraction of the water-saturated layer under cryostatic pressure and that the upstanding ice wedges, which bound the polygons, form the boundaries to the closed system. There is some similarity, therefore, between these features and the closed system pin-gos of the Mackenzie Delta with respect to genesis. (Knapp-USGS) W72-11982

ICE CORED MORAINE FORMATION AND DEGRADATION, DONJEK GLACIER, YUKON TERRITORY, CANADA, Ottawa Univ. (Ontario). Dept. of Geography.

P. G. Johnson.

Geografiska Annaler, Vol 53A, No 3-4, p 198-202, 1971. 4 fig, 11 ref.

Descriptors: *Glaciers, *Canada, *Glacial drift, Sediments, Ice, Ablation, Movement, Geomorphology, Regimen. Identifiers: *Ice-cored moraines, *Donjek Glacier

The ice core of moraines at the terminus of the Donjek Glacier, Canada, is primarily composed of glacier ice and not snow-bank ice. The widespread glacier ice and not snow-bank ice. The widespread occurrence of these ice-cored moraines in the area is the result of two main processes, one a shearpush mechanism of buried stagnant ice, and the other due to ablation and fluvial deposits accumulating on a stagnant ice wedge being pushed in front of the presently surging glacier. Degradation of these moraines is due to five main processes, all of which are directly related to the occurrence of the ice core. (Knapp-USGS)

OXYGEN DEPLETION IN ICE COVERED

RIVER, Alberta Univ., Calgary. Dept. of Civil Engineer-For primary bibliographic entry see Field 05B. W72-11989

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MILITARY FACILITIES AND ENVIRONMEN-TAL STRESSES IN COLD REGIONS, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 05B. W72-12014

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).

Sredneaziatskii Nauchno-Issledovatel skiGidrometeorologicheski Institut, Tashkent

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 44 (59), V. L. Shul'ts and V. K. Nozdryukhin, edi-tors, 1969, 127 p. Nauchno-Issledovatel'skiy

Descriptors: *Glaciers, *Glaciology, *Glaciohydrology, Orography, Mountains, Eleva-tion, Geomorphology, Meteorology, Albedo, Snow, Snowpacks, Firn, Ice, Avalanches, Glacial drift, Ablation, Runoff, Variability, Mapping, In-ternational Hydrological Decade. Identifiers: USSR, *Soviet Central Asia, *Glacier

mass balance, *Glacier runoff, Glacier tongues, Firn line, Snow line, Stereoplanigraphs.

This collection of 15 papers is devoted to a study of glaciers in various parts of Soviet Central Asia and to an examination of glacier runoff and its role and to an examination of glacier runoff and its role in total streamflow. Specific topics include: (1) glaciers in upper reaches of the Koksu River; (2) modern glaciers in the Kashkadar' ya and Surkhandar' ya River basins; (3) variability of snow properties; (4) snowpacks in upper reaches of the Chimganka River (1962-66); (5) runoff regime of the Bakalak River; (6) computation of flow in glacier-fed rivers; (7) mass balance of the Imat Glacier; (8) classification fed rivers; (7) mass balance of the Imat Glacier; (8) mechanics of glacier movement; (9) classification and spatial variability of albedo of a homogeneous glacier surface during the ablation season; (10) use of a stereoplanigraph for mapping glaciers; and (11) glaciers of the Nuratoo Mountain range. (Josefson-USGS)
W72-12018

INVESTIGATIONS OF LAKE-EFFECT

SNOWSTORMS, Cornell Aeronautical Lab, Inc., Buffalo, N.Y. W. J. Eadie, U. Katz, and C. W. Rogers. Available from the National Technical Informa-tion Service as COM-72-10267, \$3.00 in paper tion Service as COM-12-1026/, 53.00 in paper copy, \$0.95 in microfiche. Cornell Aeronautical Laboratory, Inc Technical Report No VC-3034-M-1 (Final Contract Report E22-59-71 (N)), November 29, 1971. 44 p, 19 fig, 16 ref. Contract No E22-59-71 (N).

Descriptors: *Snow surveys, *Meteorology, *Data collections, *Model studies, *New York, Lake

Erie, Lake Ontario, Snowfall, Storms, Crystals, Shape, Size, Gages, Hydrologic budget, Measure-ment, Forecasting, Numerical analysis, Correlation analysis.

ervational and mesoscale modeling studies of Observational and mesoscale modeling studies of lake-effect snowstorms were carried out in the western New York area during the winter of 1970.

A portable snow sampling system was developed to measure the fall velocities of snow crystals and to record the size and shape of the crystals. Data are presented for small snow pellets, plane dendrites, spatial dendrites, aggregates, and a variety of unclassifiable snow forms. Additional surface snow crystal observations were obtional surface snow crystal observations were ob-tained in lake-effect snowstorms produced by Lake Erie and Lake Ontario. A test of a small net-Lake Erie and Lake Ontario. A test of a small net-work of automatic snow gages showed satisfactory correlations among the measurements of the in-dividual gages in light-to-moderate snowfall. The single-layer Lavoie model for the steady state mesoscale circulations produced by the flow of cold air over Lake Erie was generalized to treat the joint Lake Erie-Lake Ontario system. Numeri-cal experiments with moist modifications of the two-lake model are discussed. An example of a nu-merical experiment is based on a Lake Erie storm, in which narrow intense bands were predicted in which narrow intense bands were predicted from both Lake Erie and Lake Ontario. Calculated water budget values for the predicted storm bands are described. (Woodard-USGS) W72-12029

A STUDY OF THE EFFECTS OF A COMMER-CIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE

AREAS,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
For primary bibliographic entry see Field 05C.

PHYSICS OF ICE, Eidgenoessische Technische Hochschule, Zurich (Switzerland).

(Switzerland).

H. Granicher, and F. Jona.

Available from NTIS Springfield, Va., 22151 as AD-738 154; Price \$3.00 Paper copy; 95 cents microfiche. Army Cold Regions Research and Engineering Laboratory Draft Translation Report TL 303, January 1972. 15 p, 2 fig, 42 ref. (Originally published by Birkhauser Verlag, Basel and Stutgart, February 3, 1960). DACW-35-68-C-0069.

Descriptors: *Ice, *Physical properties, *Crystal-lography, *Cryology, *Electrical properties, Elec-trical conductance, Hydrogen bonding, Physics.

A review and bibliography of the physics of ice are presented. The unusual structural and physical properties of ice create problems which were properties of ice create problems which were solved only recently by new research methods, mainly in neutron deflection, proton spin resonance, and study of disorder phenomena in crystals. The water molecules in ice crystals cohere solely through hydrogen bonds. Therefore, ice is a suitable research object for the study of these bonds and their properties. The great importance of hydrogen bonds in chemistry, particularly in organic and physiological chemistry, is receiving increasing recognition. Hydrogen bonds are also of interest to the crystallographer and to the physicist. The mobility of protons in ice greatly surpasses the usual mobilities involved in ionic conduction: it even can be compared with the elecconduction; it even can be compared with the electronic mobility of an average semiconductor. (K-napp-USGS)
W72-12375

DEFORMATION OF NATURAL SOIL WATER DISPERSION SYSTEMS UPON THAWING, F. G. Bakulin, and V. F. Zhukov. Available from NTIS, Springfield, Va 22151 as AD-738 183, Price \$3.00 paper copy; 95 cents

microfiche. Army Cold Regions Research and Engineering Laboratory Draft Translation Report TL 312, January 1972. 10 p, 4 fig. 10 ref. (Originally published in Izvestii Akademii Nauk SSSR, Ordelenie Tekhnicheskikh Nauk, No 7, p 132-136, luly 1952.

Descriptors: "Frost, "Ice, "Frost heaving, "Rock mechanics, "Frost action, Freezing, Frozen ground, Thawing, Cryology, Deformation, Mechanical properties, Pressure, Rock properties.

Mechanical properties, Pressure, Rock properties.

Frozen rocks, depending on the degree of dispersion of water, initial density, moisture, and cooling rate during freezing, possess definite structures which characterize the rock as a complex body with intercalations of ice and mineral jointings. A general increase in the size of a freezing rock caused by ice separation is accompanied by the formation and compaction of separated mineral aggregates containing slightly more moisture than the plasticity limit. Frozen rocks keep their structure to some extent while thawing. A frozen, heavily ice-saturated rock compacts while thawing because of a decrease in the size of the macropores. Mineral aggregates do not compact while thawing, even under a load up to 6-8 Kg/sq cm; their size can even increase because of swelling of clays. The only compaction of frozen rock during thawing occurs with disintegration of structure. Compaction must be determined under field conditions on the basis of a study of the structure of the entire mass of thawing rock. (K-napp-USGS) napp-USGS) W72-12386

SNOW ICE AND ITS SIGNIFICANCE IN COM-PUTING THE THICKNESS OF THE ICE COVER,

A. G. Deriugin.

Available from NTIS, Springfield, Va. 22151 as AD-737 824, Price \$3.00 Paper copy; 95 cents microfiche. Army Cold Region Research and Engineering Laboratory Draft Translation Report TL 299, January 1972. 30 p, 3 fig, 5 tab, 13 ref. (Originally published in Gosudarstvennyy Gidrologicheskiy Institut Trudy, Vol 148, p 29-44, Leningrad). DACW-35-68-C-0069. A. G. Deriugin.

Descriptors: *Snow, *Ice cover, *Freezing, Ice, Lakes, Rivers, Iced lakes, Lake ice, Air tempera-Identifiers: *USSR.

The process of snow ice formation is considered and a correction of the formula for computing the thickness of the ice cover, taking into account this phenomenon, is proposed. On the lakes of the Leningrad, Novgorod, and Kalinin regions snow ice accounted in certain cases for 60%-70% of the total thickness of ice. Formation of snow ice is preceded by the appearance of water on the ice under the snow. Most of this water comes from under the show. Most of this water comes from below, from the body of water, as a consequence of overloading of the ice cover by snow, although a small amount of water may be added as a result of the melting of snow during thaws or from liquid precipitation. The flow of water onto the ice cover precipitation. The flow of water onto the ice cover occurs not only through cracks of thermal origin, but also through shore-line cracks formed as a result of water-level fluctuations. In some cases the shore-line cracks are the main source of flooding the snow with water. The chief factors determining the process of snow ice formation in a quantitative expression are the thickness of the snow cover on the ice and the air temperature. (K-napp. USGS) napp-USGS) W72-12387

2D. Evaporation and Transpiration

COMPARISON OF EVAPORATION COMPUTA-TION METHODS, PRETTY LAKE, LAGRANGE COUNTY, NORTHEASTERN INDIANA, Geological Survey, Washington, D.C.

Field 02-WATER CYCLE

Group 2D-Evaporation and Transpiration

J. F. Ficke.

Available from GPO, Washington, D. C. 20402, Price 70 cents (paper copy). Geological Survey Professional Paper 686-A, 1972. 49 p, 31 fig, 21

Descriptors: *Evaporation, *Lakes, *Indiana, Descriptors: "Evaporation, "Lakes, "Indiana, "Mass transfer, Instrumentation, Data collections, Energy budget, Water balance, Evaporation pans, Hydrologic budget, Evaporimeters, Meteorologi-cal data, Meteorology. Identifiers: Pretty Lake (Ind).

Evaporation from Pretty Lake, Indiana, was computed for a 2-1/2-year period between 1963 and 1965 by 5 methods, including energy budget, masstransfer parameters, a water budget, a class-A pan, and a computed pan evaporation technique. The seasonal totals for the different methods are within 8% of their mean and are within 11% of the rate of 79 centimeters per year determined from published maps based on evaporation-pan data. Period-by-period differences among the methods are larger than the annual differences, but there is a general agreement among the evaporation hydro-graphs produced by the different computation methods. The need for sophisticated equipment, frequent temperature surveys, and complex com-putations makes the energy budget the most ex-pensive of the several methods used. The masstransfer system proved to be an effective low-cost means of computing evaporation, a means that is well suited to low evaporation rates. Springtim and autumn evaporation rates computed by the mass-transfer methods were slightly higher than rates computed by other methods, and summer rates from mass-transfer computations were slightly lower than rates computed by other methods. Assuming that Pretty Lake is typical of the many small natural lakes in its region, in most cases the evaporation information needed for hydrologic studies can be provided with satisfactory accuracy by a combination of the mass-transfer method and one or two other methods, without the expense of a complex energy-budget study. (Knapp-USGS) W72-11741

MAXIMUM POTENTIAL EVAPOTRANSPIRA-TION FREQUENCY-EAST CENTRAL U. S., Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed. J. L. McGuinness, and L. H. Parmele. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8943, p 207-214, June 1972. 3 fig, 3 tab, 11 ref, append.

Descriptors: *Evapotranspiration, *Statistics, *Distribution patterns, *Variability, Probability, Irrigation, Planning, Lysimeters, Frequency anal-

In the east-central United States maximum 1-day, 7-day, 15-day, and monthly values of evapotrans-piration as measured by a lysimeter, and potential evapotranspiration as estimated by a computed lake evaporation are log-normally distributed. Equations were developed to estimate the two parameters of this distribution for any duration made to a broad area of the east-central United States. (Knapp-USGS) from 1 day to 1 month during the April to November season. A generalization of the data is

CENTRAL CALIFORNIA EVAPOTRANSPIRA-

TION FREQUENCIES, California Univ., Davis. Dept. of Water Science

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Cautorma Ciav., Santa and Engineering.
W. O. Pruitt, S. von Oettingen, and D. L. Morgan.
Journal of the Irrigation and Drainage Division,
American Society of Civil Engineers Vol 98, No
IR2, Paper 8941, p 177-184, June 1972. 2 fig, 9 ref.

Descriptors: *Evapotranspiration, *Frequency analysis, *Irrigation design, Variability, Statistics, Statistical methods, Probability, Climatology, Lysimeters, Soil-water-plant relationships, Lysimeters, *California. -California. Identifiers: *Davis (Calif).

Frequency distribution patterns of daily evapotranspiration are presented for an irrigated grass cover grown in a highly sensitive, weighing lysimeter at Davis, Calif., over a 10-yr period. In response to climate variation, patterns ranged from highly skewed ones in winter to very close to normal distributions in midsummer. The imnormal distributions in midsummer. The importance of basing irrigation-system design on careful analysis of probable variation of evapotranspiration rather than on long-term mean monthly data was dramatically illustrated. Even for crop and soil conditions requiring very infrequent irrigations, a system design must be some 15% higher than the 10-yr monthly mean of 0.26 in per day for June or July. In order to cover 99% of the cases under a crop-soil combination with only 1 in. of readily available moisture, the peak design rate would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day. (Knapper and would need to be 0.36 in per day.) rate would need to be 0.36 in. per day. (Knapp-USGS)

CONSUMPTIVE USE BY IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN

WYOMING, Wyoming Univ., Laramie. Water Resources Research Inst.

T. J. Swartz, R. D. Burman, and P. A. Rechard. T.J. Swartz, R. D. Burman, and P. A. Kecnaru. Available from the National Technical Informa-tion Service as PB-211 125, \$3.00 in paper copy, \$0.95 in microfiche. Wyoning Water Resources Series No 29, May 1972, 89 p, 23 fig, 18 tab, 22 ref. OWRR B-003-WYO (4).

Descriptors: *Evapotranspiration, *Lysimeter, Hydrologic budget, Wetlands, Streamflow, *Con-sumptive use, *Wyoming. Identifiers: *Medicine Bow River, *Jensen-Haise

An area along the Medicine Bow River in south central Wyoming was instrumented to obtain esti-mates of consumptive use (evapotranspiration) from irrigated high mountain meadows. Four basic methods were employed: non-weighing tank lysimeters, the hydrologic budget, the Modified Jensen-Haise method, and an adaptation of the Blaney-Criddle method. A description of the instrumentation required to secure the necessary data for these methods, the results of the applicadata for these methods, and comparisons of the results are presented. Analysis revealed that estimates by the Blaney-Criddle method were consistently less than the values obtained by any of the other methods. Estimates by the Jensen-Haise method compared favorably, on a weekly basis, with the expectranspiration measured from the with the evapotranspiration measured from the tank lysimeters. Comparisons also showed that estimates by the Modified Jensen-Haise method produced the least discrepancy from the seasonal consumptive use determined by the hydrologic budget. W72-12004

HYDROLOGY OF IRRIGATED LAND (GIDROLOGIYA OROSHAYEMYKH ZEMEL'). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR) bibliographic entry see Field 03F.

THE INFLUENCE OF POTASSIUM ON THE TRANSPIRATION RATE AND STOMATAL OPENING IN TRITICUM AESTIVUM AND PISUM SATIVUM,

Lund Univ. (Sweden). Dept. of Plant Physiology. GH. Brag. Physiologic Plantarum, Vol. 26, No. 2, p 250-257, 1972. 5 fig, 3 tab, 23 ref.

Descriptors: *Evapotranspiration, *Lysimeters, *Frequency analysis, *Coasts, *Valleys, Topography, Crops, Advection, Climatic data, *California, Winds, Growth stages, Grasses, Temperature. Identifiers: *Crop roughness. Year-round mild temperatures moving through gradual gradations characterize the climate of the coastal valleys of central California more than do

Descriptors: *Potassium, *Transpiration control, *Plant physiology, *Stomata, Sodium, Laboratory tests, Wheat, Leaves.

Very little attention has been paid to the influence of mineral nutrients on the transpiration rate and stomatal behavior of intact plants. It is unclear whether the relationship between K and stomatal opening is directly physiological or indirectly morphological. The influence of K on the transpiration rate of Triticum aestivum and Pisum sativum grown in nutrient solutions was investigated. Stomatal aperture and transpiration rates were found inversely proportional to K levels. In short term experiments, KCl additions to K-deficient Triticum plants resulted in transpiration rate decreases up to 50% in 2 hours. Comparative tests with NaCl gave the same results, indicating that this short-term reaction is not K-specific. The observed effect is probably explained by

The observed effect is probably explained changes in stomatal aperture. (Casey-Arizona) W72-12345

COASTAL CALIFORNIA EVAPOTRANSPIRA-

TION FREQUENCIES, Agricultural Research Service, Weslo, Tex. Soil

Agricultural Research Service, Weslo, Tex. Soil and Water Conservation Research Div; Agricultural Research Service, Beltsville, Md.; and Agricultural Research Service, Fort Collins, Colo. P. R. Nixon, G. P. Lawless, and G. V. Richardson. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 185-191, June 1972. 3 fig, 3 ref.

coastal valleys of central cantonna more than too clearly defined seasons. Because of advective cooling, fog and clouds along the pacific coast, the climate of these coastal valleys is influenced to some degree by maritime conditions. Examples of these influences are presented with data collected some degree by maritime conditions. Examples of these influences are presented with data collected in a coastal valley 8 miles (13 km) from the ocean near Lompoc, California. The data are from 1 cm hydraulical-weighing lysimeters containing irrigated perennial rye grass as an evapotranspiration (ET) reference crop. Because of the inaccuracy of ET prediction equations all climatic data were ignored. Monthly frequency distributions of daily ET and frequency distributions of 1-day through 30-day mean ET summer rates are presented. Although it would be very desirable to have more than the 2-1/4 yr of data that were available, it was felt that the frequency based on these data should consider that distance from the ocean has an important effect on ET rates in ocean has an important effect on ET rates in coastal valleys. Crop roughness and stage of growth are also influencing factors as well as grown are asso influencing factors as well as ocean breezes and topography. Peak ET rates from field crops in this coastal valley can be 15-20% greater than rates of the aerodynamically smooth rye grass. (Casey-Arizona) W72-12352

PEAK WATER REQUIREMENTS OF CROPS IN

PEAK WATER REQUIREMENTS OF CROPS IN SOUTHERN IDAHO, Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.

J. L. Wright, and M. H. Jensen.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 193-201, June 1972. 4 fig, 8 ref.

Descriptors: *Evapotranspiration, *Climatic data, *Lysimeters, *Estimating equations, *Alfalfa, Irrigation practices, Frequency analysis, Winds, Arid lands, Micrometeorology, Crop response, Advection, *Idaho.

Identifiers: *Potential evapotranspiration, *Crop

Because of increasing water costs, the nature of many new sprinkler systems and because many areas like southern Idaho produce high-value crops that are extremely sensitive to moisture stress, capacities of new irrigation systems must be designed to closer tolerances. Two years of lysimeter measurements of evapotranspiration (ET) and the associated energy balance components were used to develop and verify procedures for estimating ET from meteorological data. Peal: water use requirements for well-watered alfalfa were determined for southern Idaho from frequency distributions of mean ET rates for 1-day, 3-day, 7-day, 15-day, and 30-day averaging periods. The daily ET computed showed large daily variations and demonstrated the need for frequency analysis and precise engineering planning for such arid regions. For the period of May through August, the peak single-day rate exceeded 0.4 in/day (10 mm). The peak 30-day period was from July 11 through August 10. As such information becomes available, it increases the need for yield estimates and economic return relationships of crops when managed at the various probability levels of peak ET rate. (Casey-Arizona) W72-12353

WATER DEFICITS—IRRIGATION DESIGN AND PROGRAMMING, California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 03F. W72-12354

2E. Streamflow and Runoff

APPLICATION OF WATER TEMPERATURES TO THE PROBLEM OF LATERAL MIXING IN THE GREAT BEAR MACKENZIE RIVER SYSTEM, British Columbia Univ., Vancouver. Dept of

Geography. J. R. Mackay.

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Canadian Journal of Earth Sciences, Vol 9, No 7, p 913-917, July 1972. 4 fig, 6 ref.

Descriptors: *Water temperature, *Mixing, *Rivers, *Canada, *Remote sensing, Tracers, Tracking techniques, Water quality, Surveys. Identifiers: Great Bear-Mackenzie River system (Canada).

Cross-river temperature profiles were run in mid-June 1971 at approximately 20 km intervals from the confluence of the Great Bear and Mackenzie Rivers, at Fort Norman, N.W.T., to the Mackenzie Delta, a distance of 650 km. As the Great Bear River was cold, and the Mackenzie River warm, the cross-profiles provide a record of the lateral mixing of the two rivers. A flow distance of 500 km was required for nearly complete mixing. The 1971 cross-river temperature profiles and aerial infrared imagery taken in 1969 show a good agreement in the mixing pattern. It is suggested that where water temperature contrasts exist, temperatures may serve as one of the easiest and most economical of the tracers suitable for mixing studies. (Knapp-USGS)

SEICHES OF SYDNEY HARBOR, N. S., Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.

Canadian Journal of Earth Sciences, Vol 9, No 7, p 857-862, July 1972. 4 fig, 2 tab, 7 ref.

Descriptors: "Seiches, "Bays, "Canada, "Mathematical models, Waves (Water), Numerical analysis, Surges, Wind tides, Winds, Weather. Identifiers: "Sydney Harbor (Nova Scotia).

The periods and responses of the free oscillations were calculated using one-dimensional models of

Sydney Harbor, Nova Scotia. After Rayleigh's mouth correction is taken into account, it is evident that the prominent wave often recorded at North Sydney is the fundamental seiche. The seiche is induced by the passage of weather systems along the coast of Nova Scotia. Its response could be reduced by building a dam across the North West Arm. (Knapp-USGS) W72-11747

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

For primary bibliographic entry see Field 02C.

DATA ON MODERN GLACIERS IN THE KOKSU RIVER BASIN (NEKOTORYYE DANNYYE O SOVREMENNOM OLEDENENI BASSEYNA R. KOKSU),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11775

WATER REGIME OF THE KOKSU RIVER (VODNYY REZHIM R. KOKSU), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR). For primary bibliographic entry see Field 02C. W72-11777

HYDROLOGIC REGIME OF GLACIERS OF THE ALAY MOUNTAIN RANGE (GIDROLOGICHESKIY REZHIM LEDNIKOV ALAYSKOGO KHREBTA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C. W72-11780

MODERN GLACIERS IN THE SOKH RIVER
BASIN (SOVREMENNOYE OLEDENENIYE
BASSEYNA R. SOKH),
Sredneaziatskii Nauchno-Issledovatelsii
Institut, Tashkent
(USSR).
For primary bibliographic entry see Field 02C.
W72-11781

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS, Alaska Univ., College. Inst. of Water Resources. G. L. Guymon.

Available from the National Technical Information of the National Informati

Available from the National Technical Information Service as PB-211 079, \$3.00 in paper copy, \$0.95 in microfiche. Institute of Water Resources, University of Alaska, Fairbanks, Alaska, Report no IWR-21, June, 1972. 105 p, 5 fig, 28 ref, 3 append. OWRR A-036-ALAS (2).

Descriptors: *Computer models, *Momentum transfer, *Ion transport, *Sediment transport, *Open channel flow, Mathematical models, Engineering, Water quality control, Water pollution control, Hydrodynamics, Surface waters, Aquatic, *Model studies.

Identifiers: *Finite-Element Method, Variational principle, Coupled problems.

Because of current and anticipated needs in resources planning and environmental conservation decision processes, greater levels of solution precision are required for the fundamentally complex problem of simulating pollutant movement and fate in the aquatic environment. The objective was to extend the technology for a general attack on solving surface water mass and momentum transport problems. Specifically, one class of the finite-element methods was explored to develop a general purpose computer program for modeling regional surface water systems. A quasi-linear variational principle and finite-element solution procedure was developed for the two-dimensional Eulerian equations of fluid motion. Continuity was included as a Lagrangian constraining condition. The resulting set of linear equations is solved in time by standard integration methods where the basic non-linearity of the governing equations of motion are handled by a psuedo-iterative technique. Additionally, an improved finite-element procedure for the mass transport equations is presented. A technique of dealing with semi-coupling of the mass and momentum problems is explored in addition to the coupling problem between separate chemical and biological species. Computer programs and algorithms are included. The conclusions are that the finite-element methods will provide a valuable tool, in addition to the finite-difference methods, for dealing with complex transport problems.

QUANTITATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 04A. W72-11895

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE. Geological Survey, Nashville, Tenn. G. K. Moore, and J. M. Wilson. Tennessee Division of Water Resources, Water Resources Series No 9, 1972. 77 p, 27 fig, 8 tab, 31 ref. append.

Descriptors: "Water resources, "Tennessee, "Streamflow, "Groundwater, "Water yield, Water quality, Hydrogeology, Hydrologic data, Data collections, Water balance, Water resources development, Water wells, Springs.

Identifiers: Center Hill Lake Region (Tenn).

The Central Hill Lake region (909 sq mi) in central Tennessee is almost equally in the Central Basin and the Eastern Highland Rim. Land surface in the Central Basin generally consists of narrow valleys and the steep sides of narrow ridges. The soils range from 0 to 30 feet thick but average only 3 ft thick. Bedrock is flat-lying limestone of Ordovician age. The Highland Rim is a level to rolling plateau and the soil cover generally is 20 to 100 feet thick. Bedrock is flat-lying limestone of Mississippian age. Average precipitation is 53 inches; Evaporation and transpiration consum 36 inches; the remaining 17 inches leaves the area as streamflow. The average streamflow at 26 sites in the region is 1.4 cubic feet per second per square mile. Raw water from streams in the region generally meets the chemical standards recommended for drinking water. Maximum potential yields are 100 gpm from the soils, 200 gpm from alluvium, and several thousand gallons per minute from solution cavities. Water from wells generally meets the chemical standards for drinking water. Most springs are small, but 25% have flows ranging from 50 to 2,000 gpm. Spring water is similar in chemical quality to well water. (Knapp-USGS) W72-11978

Field 02-WATER CYCLE

Group 2E-Streamflow and Runoff

CHANNEL CHARACTERISTICS IN A MEAN-DERING TIDAL CHANNEL: CROOKED

RIVER, FLORIDA,
Wisconsin Univ., Milwaukee. Dept. of Geography; and Wisconsin Univ., Madison. Dept. of

Geology and Geophysics. G. H. Dury. Geografiska Annaler, Vol 53A, No 3-4, p 188-197, 1971. 5 fig, 2 tab, 17 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, Florida, Geomorphology, Sediment transport, Tidal effects, Streamflow, Identifiers: *Crooked River (Fla).

Crooked River, Florida, is a double-mouthed meandering tidal channel with an axial length of some 24 km and a mean sinuosity of 1.7, mostly in sediments derived from old beach systems be contact at some places with bedrock of Tertiary limestone. Its hydraulic geometry accords generally, and in some respects closely, with the geometry of a wholly tidal creek. Maximum pool depth appears to be complexly determined, with deflection angle through pools and a radius factor supplying the chief definitions of controlling bend tightness: a pool width factor and the curvature tightness: a pool width factor and the curvature ratio are also relevant. Some 51% of the variance in maximum depth is statistically accounted for, with an average discrepancy between observed and computed depth of less than 6%. (Knapp-W72-11983

FACTORS CONTRIBUTING TO UNUSUALLY LOW RUNOFF DURING THE PERIOD 1962-68
IN THE CONCHO RIVER BASIN, TEXAS,
Geological Survey, Washington, D.C.

S. P. Sauer. S.F. Sauer.

For sale by the Superintendent Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$0.35. Geological Survey Water-Supply Paper 1999-L. 1972. 48 p, 16 fig. 11 tab, 25

Descriptors: *Water yield, *Runoff, *Texas, *Droughts, Water balance, Rainfall-runoff relationships, Streamflow, Irrigation water, Diversion, Base flow, Rainfall intensity. Identifiers: *Concho River (Tex).

To determine the reasons for the unusually low runoff in the Concho River basin of Texas during the period 1962-68, the physical developments and climatic changes in the basin were identified and related to changes in the regimen of streamflow. Land use, brush infestation, and land-treatment practices have not caused significant cha the rainfall-runoff relationship. The base flow of the streams is materially reduced by surface-water irrigation diversions. Annual rainfall is highly variable, with little serial correlation. The frequency of monthly rainfall equal to or greater than 2.0 inches during the period 1943-68, and especially during the period 1962-68, was significantly less than the long-term averages. Analyses of annual runoff data, adjusted for depletions, show large variations in annual runoff. Coefficients of varia-tion range from 0.8 to 1.4, and first-order serial correlations range from 0.01 to 0.28. The estimated recurrence interval of the 1962-68 drough, is about 200 years. The basic cause for the relatively low runoff during the period 1962-68 was the lack of high-intensity, long-duration storms. (Knapp-USGS) W72-11987

MATHEMATICAL MODEL OF RIVER HOOGHLY, Manchester Univ. (England).

Manchester Univ. (England).

D. M. McDowell, and D. Prandle.

Journal of the Waterways and Harbors Division,
American Society of Civil Engineers Vol 98, No
WW., Paper 8866, p 225-242, May 1972. 14 fig, 1
tab, 4 ref, append.

Descriptors: *Tidal bores, *Estuaries, *Numerical analysis, "Mathematical models, Water levels, Water level fluctuations, Tidal effects. Identifiers: Hooghly River (India).

Finite difference solutions to the one-dimensional equations of motion for shallow water waves were applied to the tidal region of the River Hooghly. Reproduction of flow conditions was achieved by optimization of the friction parameters and refinements or adjustments to the available data. The mathematical model formulated is capable of satisfactory reproduction of tidal levels and velocities throughout the section of the river considered. The neglect of the tidal bore as a discontinuity did not adversely affect the overall reproduction of tidal elevations in the river. If a more detailed reproduction of the propagation of the bore is required recourse should be made to the method of characteristics. Comparison of the two finite difference schemes suggests that im-provement in the overall accuracy of the model is unlikely to result from increased accuracy in the numerical solution of the equations of motion. (Knapp-USGS) W72-11994

EFFECTS OF INFLOW CONDITION ON HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B. W72-11998

PARAMETER ESTIMATION FOR FIRST-ORDER AUTOREGRESSIVE MODEL Instituto Geografico Nacional, Guatemala City.
L. E. Garcia-Martinez.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY8, Paper 9119, p 1343-1349, August 1972. 1 tab, 9 ref, ap-

Descriptors: *Mathematical models, *Regression analysis, *Markov processes, *Statistics, *Statistical methods, Simulation analysis, Probability, Stochastic processes. Identifiers: Autoregressive models.

Stochastic simulation of streamflow depends upon estimation of the correlation structure of the series. Several estimators of the autocorrelation coefficient are investigated and all are biased for sample sizes beyond those usually encountered in hydrology. That estimator with least bias has greatest variance and that with least variance has greatest bias. The estimator chosen as best must be judged on the relative effects of bias and vari-ance. (Knapp-USGS) W72-11999

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12001

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12002

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

W72-12003

WATER RESOURCES OBSERVATORY STREAMFLOW DATA - WATER YEARS 1965 THROUGH 1971, Wyoming Univ., Research Inst. Laramie. Water Resources For primary bibliographic entry see Field 07C. W72-12005

VARIATIONS IN MINIMUM RUNOFF FROM SMALL BASINS (ALIVALUMAN VAIH-TELUISTA PIENILLA ALUEILLA), Vesientutkimuslaitos, Vesihallitus, Helsinki (Fin-

Vesientutkimuslaitoksen Julkaisuja, No 1, Vesihallitus, Helsinki, 1971. 64 p, 11 fig, 10 tab, 23 ref, 2 append.

Descriptors: *Runoff, *Watersheds (Basins), *Small watersheds, *Variability, Correlation anal-"Small watersheus, "Variability, Correlation analysis, Regression analysis, Frequency analysis, Model studies, Mathematical models, Meteorology, Temperature, Precipitation (Atmospheric), Topography, Slopes, Forests, Soils, Peat, Drainage, Seasonal.

Identifiers: "Finland.

Assessment of the effects of certain climatic and Assessment of the effects of certain running managements basin characteristics on minimum runoff was based on observations made during winter and summer periods of 1958-69 at 32 small drainage basins in various parts of Finland. The purpose of the analyses was to construct models to determine the analyses was to construct models to determine minimum runoff during periods of low runoff, du-ration of low runoff, and intervals of recurrence of low runoff. Mean temperatures of February and July were significant climatic factors in almost all models developed and correlated with various ter-rain factors, such as slope of the ground and per-centage of cultivated fields in the drainage basin. The most important basin factor was the slope, which showed a close positive correlation with the percentage of coarse soils in the drainage basin and with the degree of forest cover, and a negative correlation with the percentage of cultivated fields and peatlands and with temperature. The models are adaptable to basins which have climatic and terrain features similar to those in the small research basins which form the foundation of the models (Losefers 110CS). models. (Josefson-USGS)

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CON-TROL AND CITY WATER SUPPLY RESER-VOIR.

North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 04A.
W72-12030

PRELIMINARY REPORT ON SMA STREAMS FLOOD FREQUENCY IN MAINE, STREAMS FLOOD FREQUENCY IN MAINE, Geological Survey, Augusta, Maine.
G. S. Hayes, and R. A. Morrill.
Available from the National Technical Information Service as PB-204 371, \$3.00 in paper copy, \$0.95 in microfiche. Geological Survey Preliminary Progress Report for Maine State Highway Commission, March 1971. 10 p, 3 tab, 2 ref, append.

Descriptors: *Streamflow, *Streamflow forecasting, *Peak discharge, *Frequency analysis, *Maine, Small watersheds, Regression analysis, Frequency curves, Hydrologic data, Analytical

Runoff records for 6 years were used to derive a formula for peaks of up to the 10-year frequency in small watersheds (1-50 sq mi) in Maine. The formula uses the following basin characteristics: drainage area, channel slope, channel length, storage, and forest cover. The formula is an adaptation of an earlier U.S. Geological Survey method

which was limited to large watersheds. Frequency curves were prepared graphically, using the annual peaks collected during the period 1964-69, for the 28 small drainage area stations in the project. Also for the same period, frequency curves were prepared for 25 long-term record gaging stations in Maine that were not affected by regulation. Peak discharges for the 2-, 5-, and 10-year recurrence intervals were computed for all 53 stations. (Woodard-USGS)

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су orRESISTANCE COEFFICIENTS FOR STEADY SPATIALLY VARIED FLOW, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W72-12043

FLOW CHARACTERISTICS WITHIN A CHANNEL BOUNDARY OF COARSE MATERIALS, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 08B. W72-12106

BORDER IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 289-307, June 1972. 13 fig, 16 ref.

Descriptors: *Mathematical models, *Floods, *Hydrology, *Irrigation, *Infiltration, Routing, Channels, Arroyos, Flood waves, Ephemeral Identifiers: *Kinematics, *Transmission loss.

A kinematic wave is a wave whose properties can be described by an equation of continuity and a stage-discharge relation, implying that momentum changes are negligible. A method is described of predicting advance rate, surface profiles and modifications with time to kinematic wave flow over an initially dry infiltrating plane. Point infil-tration rate is considered to be a function of time since wetting. The model developed is shown to since wetting. The model developed is shown to describe 2 common hydrological problems: border irrigation advance and attenuation in dry alluvial channels such as commonly occurs in the southwestern U.S. Numerical methods for solving the equations developed are described and illustrated. The partial differential equations for kinematic wave movement under time-varying space-varying lateral losses were reduced to 2 characvarying lateral losses were reduced to 2 characteristic ordinary differential equations and combined with a third equation for shock movement. Sensitivity for advance rate to the infiltration functions is shown. The model may be used to route floods through dry infiltrating channels. (Casey-Arizona) W72-12371

CAMP STREAM IHD EXPERIMENTAL BASIN

NO. 12, Ministry of Works, Wellington (New Zealand).

Water and Soil Div. L. K. Rowe, F. A. Johnson, and C. L. O'Loughlin. Annual Hydrological Research Report No 3, 1970. 13 p, 7 fig, 4 tab, 6 ref, append.

Descriptors: *International Hydrological Decade, *Demonstration watersheds, *Data collections, *Gaging stations, Networks, Stream gages, Rain gages, Stations, Hydrologic data. Identifiers: *New Zealand.

Work accomplished in IHD Experimental Basin no. 12, the Camp Stream catchment and Hut Creek, a new catchment to be incorporated in Camp Stream Experimental Basin, New Zealand,

in 1969, is summarized. Work carried out in Camp Stream includes the collection of meteorological data and data on rainfall interception by mountain beech, calibration of the flume, construction of a small trap for bed-load measurement, and tests on streamflow conductivity. The Hut Creek project is designed to define some of the basic hydrological process controlling the behavior of a foothill catchment. In particular it is proposed to establish the relationships existing between rainfall and runoff, to determine the characteristics of the flood hydrograph, and to study erosion and sediment not1, to determine the characteristics of the flood hydrograph, and to study erosion and sediment transport within the catchment. At the end of 1969 a network of seven rain gages was established in the catchment. Six of these are in a ring around the catchment and the seventh is sited almost in the center. (Knapp-USGS) W72-12374

MODEL HYDROGRAPHS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02A. W72-12376

2F. Groundwater

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER, Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France). For primary bibliographic entry see Field 05B. W72-11743

STATISTICAL PROCESSING OF LONG-TERM OBSERVATIONS OF GROUNDWATERS, Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav. H. Kriz.

Journal of Hydrology, Vol 16, No 1, p 17-37, May 1972. 7 fig, 9 tab, 4 ref.

Descriptors: *Water level fluctuations, *Ground-water, *Data processing, *Statistical methods, Statistics, Water well, Water balance, Data collec-tions, Hydrologic data. Identifiers: *Czechoslovakia.

The processing of the seventy-year series (1901-1970) of weekly groundwater levels from observa-tion well No. 12 in the Bohemian Cretaceous Plateau in Moravia illustrates the statistical methods used in Czechoslovakia. The so-called methods used in Czechoslovakia. The so-called characteristic levels were derived from the weekly groundwater levels for the years 1901-1970. These are goundwater levels that, on the average, are exceeded for a certain number of days in the year and often reported also as a percentage of the total duration of observation. Further characteristics are the average monthly and annual groundwater levels, calculated as arithmetic means from the weekly levels recorded in the individual hydrological years, from which, in turn, the average values cal years, from which, in turn, the average values for the entire period under study were established. The highest and the lowest annual values were established in addition, as well as the absolute exestablished in addition, as well as the absolute exteme levels for the entire period of 1901-1970. Based on the average annual groundwater levels, the hydrological years 1901-1970 were classified from the viewpoint of their yield rates. Long-term changes in the groundwater storages were studied from the plot of the course of weekly hydrographs. A detailed analysis of the groundwater level variations showed that the change in the storages proceeded, in general, in a regular rhythm. (K-napp-USGS)

PERTURBATION ANALYSIS OF THE EQUA-TION FOR THE TRANSPORT OF DISSOLVED

SOLIDS THROUGH POROUS MEDIA: L LINEAR PROBLEMS, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-11745

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11750

AVAILABILITY OF GROUNDWATER FOR IR-RIGATION FROM GLACIAL OUTWASH IN THE PERHAM AREA, OTTER TAIL COUNTY, MINNESOTA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72.11752

ELECTRICAL-ANALOG ANALYSIS OF THE HYDROLOGIC SYSTEM, TUCSON BASIN, SOUTHEASTERN ARIZONA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72-11753

THE GEOCHEMISTRY OF UNDERGROUND Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of Mineralogy. For primary bibliographic entry see Field 03C. W72-11756

GROUNDWATER PROBLEMS OF THE INTERACTION OF SALINE AND FRESH WATER, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics. For primary bibliographic entry see Field 03C. W72-11763

BALANCED UTILIZATION OF GROUND-WATER RESOURCES, Layne-Western Co., Kansas City, Mo. For primary bibliographic entry see Field 04B. W72-11917

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE. Geological Survey, Nashville, Tenn. For primary bibliographic entry see Field 02E. W72-11978

PUMPING AN ARTESIAN SOURCE FOR WATER TABLE CONTROL, Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 04B. W72-11995

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12001

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12003

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES, N. G. Kell.

Field 02-WATER CYCLE

Group 2F-Groundwater

Indian National Scientific Documentation Center, New Delhi, 1971. 287 p. (TT68-50638 and TT70-57236; Originally published by Izdatel'stvo Akademii Nauk SSSR Moskva, 1962, Leningrad.)

Descriptors: *Groundwater, *Groundwater resources, *Aquifers, *Aquifer characteristics, *Aerial photography, Spectrophotometry, Remote sensing, Terrain analysis, Mapping, Surveys, Geomorphology, Topography, Bodies of water, Soils, Vegetation, Forests, Deserts, Glacial drift, Geographical regions, Instrumentation. Identifiers: *USSR, *Turkmen SSR, *West Kazakhstan, *Northwestern RSFSR, *Estonian SSR, Aerial photographs, Photographic characteristics, Photo interpretation, Landscapes, Geobotany. teristics, Photo Geobotany.

The use of aerial photography in the search for groundwater was based on photographic surveys made by the Laboratory of Aerial Surveying of the USSR Academy of Sciences in 1958-59 in desert, semidesert, and forest zones of the USSR. The semidesert, and torest zones of the USSK. The areas photographed were the Turkmen Republic, the northern plains of the sub-Caspian lowlands between the Volga and Ural Rivers, and northwestern regions of the RSFSR, including the Leningrad, Pskov, Novgorod and Kalinin Oblasts, and parts of the Estonian SSR. The fundamental purpose of the surveys was to locate and evaluate sources of groundwater on the basis of landscape features identifiable with or indicative of the oc-currence of groundwater. The results demonstrate the results demonstrate the practicality of direct aerial observation in delineating and interpreting the surface extent of various lithologic units and their water-yielding properties. (Josefson-USGS) W72-12023

WATER-TRANSMITTING PROPERTIES OF AQUIFERS ON LONG ISLAND, NEW YORK. Geological Survey, Washington, D.C. N. E. McClymonds, and O. L. Franke. Available from GPO, Washington, DC 20402 -Price \$2.25. Geological Survey Professional Paper 627-E, 1972. 24 p, 22 fig, 3 plate, 13 tab, 28 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *New York, Data collections, Hydraulic conductivity, Transmissivity, Groundwater move-Identifiers: *Long Island (NY).

Since 1900, more than 50,000 wells have been constructed on Long Island. For at least 2,500 of these structed on Long Island. For at least 2,500 of these wells, some information was recorded that is of value in interpreting the hydrologic character of one or more of the four principal aquifers—the upper glacial, the Jameco, the Magothy, and the Lloyd. Enough information is available to make a Lloyd. Enough information is available to make a general interpretation of the hydraulic conductivity and the transmissivity of all aquifers throughout most of the island. A value of hydraulic conductivity was calculated for each lithology in each aquifer. Maps of average hydraulic conductivity were developed for each aquifer on Long Island. Maps of total aquifer transmissivity were developed by combining maps of average aquifer hydraulic conductivity and total aquifer thickness. hydraulic conductivity and total aquifer thickness. The estimated average hydraulic conductivity values are about 1,700 gpd per sq ft for the upper glacial aquifer, about 1,300 gpd per sq ft for the Magothy, and about 360 gpd per sq ft for the Magothy, and about 360 gpd per sq ft for the Lloyd. Average transmissivity values are about 200,000 gpd per ft for the upper glacial aquifer, about 100,000 gpd per ft for the Jameco, about 240,000 gpd per ft for the Magoty, and about 90,000 gpd per ft for the Lloyd. (Knapp-USGS) W72-12027 W72-12027

AN EVALUATION OF THE USE OF DRILLERS' LOGS IN LITHOLOGIC STUDIES OF THE OGALLALA FORMATION OF THE SOUTHERN HIGH PLAINS OF TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B.

W72-12031

HYDRAULIC TESTS IN HOLE UAE-1, AMCHITKA ISLAND, ALASKA, HYDRAULIC

Geological Survey, Denver, Colo. W. C. Ballance.

Available from NTIS, Springfield, Va 22151 – Price \$3.00 paper copy; 95 cents microfiche. Geological Survey Report USGS-474-102 (Amchit-ka-9), July 1972. 36 p, 20 fig, 2 tab, 3 ref. AEC. AT (29-2)-474.

Descriptors: *Boreholes, *Hydrologic data, *Data collections, *Hydrogeology, *Alaska, Groundwater movement, Deep wells, Water yield, Mining, Transmissivity, Specific capacity, Water levels, Injection, Drawdown, Water quality, Sampling, Aquifer characteristics. Identifiers: *Amchitka Island (Alaska).

Inflatable straddle packers were used to isolate and test 12 intervals of about 61 meters each in hole UAe-1, Amchitka Island, Alaska. The static water levels in the intervals tested ranged from about 34 meters below land surface in the upper interval to about 37 m below land surface in the lower interval, indicating decreasing head with depth. The relative specific capacities of isolated zones ranged from 0.007 cu m/day/m of drawdown to more than 5 cu m/day/m of drawdown. The lowest relative specific capacities were found below a depth of 1,922 m. The objectives of the tests were to obtain hydraulic information for better prediction of direction and velocity of groundwater movement, to aid in selection of an interval suitable from a hydrologic standpoint for mining a chamber thousands of feet below the water table, and to obtain samples of water for chemical and radiochemical analysis. (Woodard-W72-12037

DENSITY INDUCED MIXING IN CONFINED AOUIFERS.

Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and riyurodynamics. For primary bibliographic entry see Field 05B. W72-12041

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS, Hawaii Univ., Honolulu. Water Research Center. For primary bibliographic entry see Field 04B. W72-12101

GEOPHYSICAL MAPPING OF THE WATER TABLE IN EOCENE SEDIMENTS: FEASIBILITY AND RELIABILITY EVALUATION. Mississippi State Univ., State College. Water

Resources Research Inst. F. E. Followill.

Available from the National Technical Informa-tion Service as PB-211 148, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Re-port, 1972, 38 p, 26 fig, 2 tab, 10 ref. OWRR A-053-MISS (1).

Descriptors: Aquifers, Geophysics, *Seismology, *Resistivity, *Geologic mapping, *Mississippi, *Water table, Hydrogeology, Sedimentation. Identifiers: *Eocene sediments.

Shallow seismic refraction measurements and vertical electrical soundings in the outcrop area of Eocene aquifers at seven locations in central and north central Mississippi have been compared with surface and subsurface hydrologic and lithologic conditions. Deeper Wenner soundings were erratic and had to be smoothed prior to interpretation, but were satisfactory for shallow measurements when combined with the seismic refraction measurements for obtained depths to the water table. Dipole soundings using Direct-Currents proved unsatisfactory. Relative errors between depths and thicknesses estimated from the surface cophysical measurements and observed depths and thicknesses in adjacent wells ranged from 5% for shallow depths to a maximum of 15% for depths approaching 250 meters, for the combined measurements of seismic refraction and Schlum-berger soundings. Positive identification of the water table was possible with the occurrence of significant increases in both the seismic velocities and electrical resistivities at the same depth. W72-12104

A CASE STUDY OF THE HYDROGEOLOGIC CONDITIONS IN THE OUTCROP AREA OF AN

AQUIFER, Mississippi State Univ., State College. Water

Resources Research Inst. D. M. Keady, and E. E. Russell.

Symmotic from the National Technical Information Service as PB-211 151, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, 1972, 29 p, 8 fig, 10 ref. OWRR A-058-MISS (1).

Descriptors: *Hydrogeology, Groundwater, *Landslides, *Mississippi, *Sands, Clays, Silts, *Permeability, Soils, Seepage, Aquifers. Identifiers: *Tombigbee River (Miss), *Slump.

Hydrogeologic investigations in the outcrop area of the Tombigbee Sand Member, a minor aquifer in the Eutaw Formation, were conducted between Mattubby and Town Creeks in Monroe County, Mississippi. Focal point for the study was a large slump, exhibiting unusual features, along a bluff of the Tombigbee River. In the area studied, the Tombigbee Sand is unusually thick, about 190 feet. The member is composed chiefly of fine- to very fine-grained, glauconitic, micaceous sand, with variable amounts of silt and clay. The middle portion of the unit contains clay beds up to 30 feet thick, and one of these appears to be in a position to act as a glide surface for the slump. Permeability of the sand is generally low, but vertical permeability is increased by joints near the bluffs. Movement of water in soils, alluvium, and terrace deposits, which cover large portions of the out-crop, is important in the ground-water regimen. In the slump area, a small man-made lake has hindered normal drainage down the valley. Near the edge of the bluff constant seepage into joints has increased the moisture content of the sand, and has apparently decreased its shear strength, allowing large blocks to collapse when support is removed. W72-12107

DRAINAGE IN SOILS WITH INITIAL GRADIENT. Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering. For primary bibliographic entry see Field 02G. W72-12369

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B.

WELL LOSSES DUE TO REDUCED FORMA-TION PERMEABILITY, Indiana Univ., Bloomington. Dept. of Geology. For primary bibliographic entry see Field 04B. W72-12377

INVESTIGATION OF A LANDFILL IN GRANITE-LOESS TERRANE, Idaho Univ., Moscow. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W72.13229

A BASIN STUDY OF GROUND-WATER DISCHARGE FROM BEDROCK INTO GLA-CIAL DRIFT: PART 1-DEFINITION GROUNDWATER SYSTEM, Oklahoma State Univ., Stillwater. D. C. Kent, and L. V. A. Sendlein. Groundwater, Vol 10, No 4, p 24-34, July-August 1972. 10 fig, 1 tab, 10 ref.

Descriptors: "Groundwater basins, "Hydrogeology, "Iowa, "Groundwater movement, "Mapping, Aquifers, Aquifer characteristics, Water quality, Discharge (Water), Recharge, Geophysics, Discharge (Water), Recuired Geohydrologic units.
Identifiers: *Skunk River basin (Iowa).

A regional preliminary groundwater investigation in the Upper Skunk River basin near Ames, Iowa, used a systematic basin approach integrating cal, geophysical, groundwater, and quality investigations. First, second and final ap-proximation maps were constructed. Interpretation of first approximation maps led to a field protion of first approximation maps led to a field pro-gram which resulted in the second approximation maps. Examination and comparison of the second approximation maps pointed to problem areas which with further geophysical and geological field checks let to construction of the final approximation maps. A complex system of bedrock chan-nels were defined using electrical resistivity, shallow seismic refraction and geological methods Bedrock topography, subcrop geology, piezometric surface, sand and gravel thickness, distribution of water quality, resistivity data, and regolith lithology were mapped. A partially-confined bedrock aquifer and channel and shallow sands are hydraulically connected. The similarity of bedrock and piezometric surfaces is evidence of discharge the bedrock into the channel sands a gravel. A bedrock recharge map was prepared in order to define zones of groundwater recharge from the bedrock. (Knapp-USGS) W72-12379

APPLICATION OF HARRILL'S EQUATION TO A LIMESTONE AQUIFER, New Mexico Inst. of Mining and Technology,

W. K. Summers.

Groundwater, Vol 10, No 4, p 21-23, July-August 1972. 3 tab, 1 ref.

Descriptors: *Computer programs, *Aquifer testing, *Drawdown, New Mexico, Water yield, Transmissivity, Limestones, Data processing. Identifiers: *Well efficiency.

A computer program is given for applying Harrill's (1971) equation for the determination of the coefficient of transmissivity from the water level The validity and applicability of the equation are shown by using step-test data from New Mexico. (Knapp-USGS)
W72-12380

SOLUTIONS FOR PUMPING TESTS IN CARBONATE-ROCK AQUIFERS, Ohio Dept. of Natural Resources, Columbus For primary bibliographic entry see Field 04B. W72-12382

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUNTIES, GEORGICA, 1966-70, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 04B. W72.12384.

TECHNIQUE FOR PREDICTING GROUND-WATER INFLOW TO LARGE UNDERGROUND OPENINGS, Geological Survey, Denver, Colo.

W. W. Dudley.
Society of Mining Engineers Transactions, Vol 252, p 149-153, June 1972. 6 fig, 2 tab, 8 ref.

Descriptors: *Groundwater movement, *Mathematical models, "Aquifer testing, "Dewatering, "Excavation, Drawdown, Transmissivity, Water yield, Artesian aquifers, Hydraulic conductivity, Permeability.
Identifiers: *Large underground openings.

The initial step in predicting groundwater inflow into large underground excavations involves hydraulic tests in exploratory drill holes. Zones within the area of interest are isolated in the drill hole by inflatable packers and are tested by mea-suring the water-level responses to applied hydraulic stresses. These responses may then be translated into significant hydraulic characteristics of the tested rocks such as transmissivity, hydrau-lic conductivity, hydraulic potential, and storage coefficient by using a type-curve solution. Once the geometry and necessary hydraulic charac-teristics have been determined for the rock in the vicinity of the proposed opening, a mathematical model can be developed. The mathematical method applied to the model considers conditions of partial penetration and nonsteady-state, leakyartesian, constant-drawdown discharge of groundwater. A type-curve solution results in the varia-tion of discharge (inflow) with time. This technique of predicting groundwater inflow has been used in planning construction of cylindrical chambers for use in underground nuclear experi-ments by the U.S. Atomic Energy Commission. These chaf ers have been constructed in lowpermeability rocks at depths as much as 6000 ft and under hydraulic heads of thousands of feet. (Knapp-USGS) W72-12388

2G. Water in Soils

SALINITY AND WATER USE. For primary bibliographic entry see Field 03C. W72-11755

CHEMISTRY OF SALINE SOILS AND THEIR

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES,
Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science.
For primary bibliographic entry see Field 03C. W72-11760

HYDROLOGY OF SWELLING SOILS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of En-vironmental Mechanics. For primary bibliographic entry see Field 03C. W72-11761

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS, Commonwealth Scientific and Industrial Research

Organization, Wembley (Australia). Div. of Soils. For primary bibliographic entry see Field 03C. W72-11762

RELATION BETWEEN THE DEGRADATION OF DDT AND THE IRON REDOX SYSTEM IN

SOILS, Agricultural Research Service, Beltsville, Md. Soils Lab.; and Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Beltsville, M. Research Div.

For primary bibliographic entry see Field 05B. W72-11830

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES, Purdue Univ., Lafayette, Ind. Water Resources For primary bibliographic entry see Field 05C. W72-11867

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE ENVIRONMENT, Nebraska Univ., Lincoln. Water Resources

Research Inst.
For primary bibliographic entry see Field 05C.
W72-11880

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN-DOMINATED SUBARCTIC SURFACES, McMaster Univ., Hamilton (Ontario). Dept. of

McMaster Univ., riaminton (Ontario). Dept. va Geography. W. R. Rouse, and K. A. Kershaw. Arct Alp Res. 3 (4): 291-304. Illus. Maps. 1971. Identifiers: "Burning, Evaporation, Heat, "Lichen, "Soil moisture, Water regimes, Soils, Su-

Areas of ground lichen in the subarctic are particu-Areas of ground inchen in the subarcute are particularly susceptible to fire either by man's activity or by natural causes. Experimental evidence from the Hudson Bay lowlands gathered in the summer of 1970 indicates that the burning of lichen has a pronounced effect on the ground water regime. Soil moisture measurements made in a mature lichen woodland with thinly spaced trees, and in areas of recent and older burning indicate that the soil moisture under the lichen-dominated surface. was at least 40% greater than in either of the burned areas. This suggests that a mature lichen cover offers a high resistance to the evaporation of soil moisture. The nature of the evaporation regime was determined using the energy budget (Bowen Ratio) approach over each surface. These (Bowen ratio) approach over data surrements of the moisture content of the lichen made at 3 levels with the canopy. The evidence indicates that lichen-dominated surfaces act as an effective mulch in preventing evaporation from the subsur-face zone whereas the burned areas which are able to evaporate more water into the atmosphere when moist, also develop strong resistances to evapora-tion as the soil surface layers become drier. The role of ground lichen in the water budget of northern lands is significant because of its extensive cover and its destruction by fire must exert an important influence on the hydrologic and atmosphere water regimes.—Copyright (c) 1972, Biological Abstracts, Inc. W72-11885

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER, Washington Univ., Seattle. Dept. of Civil Enineering. For primary bibliographic entry see Field 05G. W72-11906

SUBGRADE MOISTURE UNDER OKLAHOMA Oklahoma State Univ., Stillwater. School of Civil

Engineering. For primary bibliographic entry see Field 04C. W72-11993

LIQUID CRYSTALS IN QUICK CLAYS, Swedish Inst. for Surface Chemistry, Stockholm. S. Friberg, and K. Roberts. Nature Physical Science, Vol 238, No 83, p 77-78, July 31, 1972. 2 fig. 11 ref.

Descriptors: *Quick clays, *Soil chemistry, *Surfactants, *Clays, *Clay minerals, Suspension,

Field 02—WATER CYCLE

Group 2G-Water in Soils

Water chemistry, Dispersion, Colloids, Ion exchange.
Identifiers: *Liquid crystals.

A liquid crystal-stabilized dispersion, though highly stable, flocculates to large aggregates before sedimentation finally occurs. Such a dispersed system can be rendered unstable by addition of sufficient salt to transform the liquid crystalline phase to micelles. It is possible that the critical micelle concentration (c.m.c.) in quick clays is depressed enough for the total solution composition to lie within the micellar solution area. The Rosenqvist theory of quick clays requires a coagulated sediment which can be dispersed to a stable suspension. This is provided by a liquid crystal dispersant. The coagulation by salts of such a dispersion may depend on the proximity of the solution composition to the micellar phase boundary. This allows variations of salt content in quick clays. The presence of organic surfactants in clay deposits allows the possibility that associated surfactant phases are responsible for the quickness of certain clays. (Knapp-USGS) W72-12013

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 05B. W72-12045

SOIL ASSOCIATIONS AND LAND CLASSIFI-CATION FOR IRRIGATION, SAN MIGUEL COUNTY, New Mexico Agricultural Experiment Station,

University Park.
For primary bibliographic entry see Field 03F.

W72-12098

A CASE STUDY OF THE HYDROGEOLOGIC CONDITIONS IN THE OUTCROP AREA OF AN

AQUIFER, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 02F. W72-12107

SOME ASPECTS OF WATER MOVEMENT THROUGH SOILS, Agricultural Research Council, Cambridge (En-

gland). Unit of Soil Physics. For primary bibliographic entry see Field 05B. W72-12216

SOME PROBLEMS IN THE DIFFUSION OF IONS IN SOILS, Oxford Univ. (England). Soil Science Lab.

Oxford Univ. (England). Soil Science Lab. For primary bibliographic entry see Field 05B. W72-12217

CATION EXCHANGE IN SOILS, Louvain Univ. (Belgium). Laboratoire Chimie Biologique. For primary bibliographic entry see Field 05B. W72-12218

SORPTION AND TRANSPORT IN SOILS, Instituut voor Toepassing van Atoomenergie in de Landbouw, Wageningen (Netherlands). For primary bibliographic entry see Field 05B. W72-12219

BITTERBRUSH SEEDLING ESTABLISHMENT AS INFLUENCED BY SOIL MOISTURE AND SOIL SURFACE TEMPERATURE, Forest Service (*USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station. For primary bibliographic entry see Field 04A. W72-12357

WATER MOVEMENT IN LAYERED SOILS. 2. EXPERIMENTAL CONFIRMATION OF A SIMULATION MODEL, Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers; Agricultural Univ.,

Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers; Agricultural Univ., Wageningen (Netherlands). Dept. of Theoretical Production Ecology; and Grenoble Univ. (France). Laboratoires de Mechani que des Fluides. L. Stroosnijder, H. van Keulen, and G. Vachaud. Netherlands Journal of Agricultural Science, Vol. 20, No. 1, p 67-72, 1972. 4 fig. 5 ref.

Descriptors: *Infiltration, *Hydraulic conductivity, *Model studies, *Soil water movement, Estimating equations, Evaluation, Hysteresis, Soil

A simulation model has been developed for predicting the movement of a rain infiltration front in a layered sandy soil. Computed results are compared with experimental results. Infiltration profiles obtained by the 2 methods are in satisfactory agreement, although there are minor deviations. The deviations may be due to incorrect assumptions concerning the hydraulic conductivity-water content relationship or to the neglect of hysteresis. The degree of agreement confirms the assertion that the behavior of soil water can be calculated accurately if the soil properties are known in sufficient detail. (Casey-Arizona) W72-12358

DRAINAGE IN SOILS WITH INITIAL GRADIENT,
Indian Inst. of Tech., Kanpur. Dept. of Civil En-

gineering.
A. J. Valsangkar, and K. Subramanya.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 309-315, June 1972. 5 fig, 11 ref.

Descriptors: *Trenches, *Non-Newtonian flow, *Groundwater movement, *Flow characteristics, *Soil water movement, Drainage water, Dupuit-Forcheimer theory, Confined water, Hydraulic gradient, Hydraulic models, Theoretical analysis Identifiers: *Unconfined flow, *Initial gradient.

Seepage through clayey and loamy soils is a common problem in the field and drainage engineering. Like many non-Newtonian fluids, seepage through such soils is initiated only when the hydraulic gradient exceeds a certain value called the initial gradient. Consequences of this type of non-Darcy behavior are of potential interest in several disciplines. In drainage problems nonrecognition of the initial gradient will result in inefficient layout of the drains. Assuming the Dupuit-Forcheimer assumptions to be valid, a general solution for unconfined flow into a trench has been derived. The importance of the initial gradient in affecting the spacing of the trench and discharge reduction, is emphasized. In confined flow, the presence of the initial gradient reduces the effective head. (Casey-Arizona)

BORDER IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center. For primary bibliographic entry see Field 02E. W72-12371

DEFORMATION OF NATURAL SOIL WATER DISPERSION SYSTEMS UPON THAWING, For primary bibliographic entry see Field 02C. W72-12386

2H. Lakes

COMPARISON OF EVAPORATION COMPUTA-TION METHODS, PRETTY LAKE, LAGRANGE COUNTY, NORTHEASTERN INDIANA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02D. W72-11741

SOME DISTINCTIVE FEATURES OF AUSTRALIAN INLAND WATERS, Monash Univ., Clayton (Australia). Dept. of Zoology. For primary bibliographic entry see Field 05C. W72-11742

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN, Wisconsin Univ., Madison. Water Chemistry Lab. For primary bibliographic entry see Field 05B. W72-11809

SURVIVAL OF SOME FRESHWATER FISHES IN THE ALKALINE EUTROPHIC WATERS OF NEBRASKA,
Hastings Coll., Nebr.
For primary bibliographic entry see Field 05C.
W72-11845

THE ALGAL BIOLOGY OF A TROPICAL MONTANE RESERVOIR (MILUNGUSI DAM, MALAWI),
Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05C.
W72-11874

SEDIMENTATION OF WILLIAMS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA,

NIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02J. W72-11977

VOLUME WEIGHT OF RESERVOIR SEDI-MENT IN FORESTED AREAS, Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station. For primary bibliographic entry see Field 02J. W72-12000

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS, Laboratory of Limnology, Leningrad (USSR). For primary bibliographic entry see Field 05B. W72-12015

INVESTIGATIONS OF LAKE-EFFECT SNOWSTORMS,
Cornell Aeronautical Lab, Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 02C.
W72-12029

MERCURY POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS, Advanced Technology Center, Inc., Dallas, Tex. For primary bibliographic entry see Field 05G.

AQUATIC VASCULAR PLANT DISTRIBUTION IN CHEAT LAKE (LAKE LYNN), WEST VIRGINIA, West Virginia Univ., Morgantown.

For primary bibliographic entry see Field 05C. W72-12085

LAKE SUPERIOR PERIPHYTON IN RELATION TO WATER QUALITY, Minnesota Univ., Minneapolis. For primary bibliographic entry see Field 05C. W72-12192

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SEASONAL CHANGES OF THE HETEROTROPHIC MICROFLORA OF THE ILAWA LAKES BOTTOM DEPOSITS, Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Po-

land).
For primary bibliographic entry see Field 05C.
W72-12254

THE INFLUENCE OF INCUBATION TEM-PERATURE ON TOTAL COUNTS OF BAC-TERIA IN WATER (WPLYW TEMPERATURY INKUBCJI WYSIEWOW NA OZNACZANIE OGOLNEJ LICZBY BAKTERII W WODZIE), WYSIEW STADO POLITE W WODZIE), Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Po-land). Katedra Mikrobiologii Technicznej. For primary bibliographic entry see Field 05C. W72-12258

MICROBIOLOGICAL CHARACTERIZATION OF GROUND DEPOSITS IN THE LAKES OF THE DISTRICT OF ILAWA IN THE YEARS OF 1960-1963 (CHARAKTERYSTYKA MIKROBIOLOGICZNA OSADOW DENNYCH JEZIOR ILAWSKICH W LATACH 1960-1963), Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Po-land). Katedra Mikrobiologii Technicznej. For primary bibliographic entry see Field 05C. W72-12259

VEGETATION OF AN ALPINE BOG ON EAST MAUI, HAWAII, R. J. Vogl, and J. Henrickson. Pac Sci. Vol 25, No 4, p 475-483, 1971, Illus.

Identifiers: *Alpine bog, Bryophytes, Carex-Mon-tis-Ecka-M, Deschampsia-Australis-M, *Hawaii, Hydrarch, Lichen, Maui, Oreobolus-Furcatus-M, Succession, Vaccinium-Pha Pahalae-D, *Vegeta-

Ten species of vascular plants, 2 bryophytes, and 1 lichen comprised the flora of a bog located on the northeast outer slopes of Haleakala Crater at 7440 ft elevation. The vegetation was dominated by Carex montis-eeka and Deschampsia australis, along with lesser amounts of Oreobolus furcatus and the dwarf Vaccinium pahalae. Despite its higher location, the area shares similarities with other Hawaiian bogs, except that it possesses very simple flora. Lobelia and/or Argyroxiphium spp. may have once existed in the bog but could spp. may have once existe in the cog out count have been eliminated by past heavy grazing. The bog occupies a large saucer-shaped depression filled with acid peat. It is considered to have developed by the process of hydrarch plant succession rather than the usual site deterioration and least settlement of the contribute of the committee of the plant retrogression.—Copyright 1972, Biological Abstracts, Inc. W72-12273

THE CARP, CYPRINUS CARPIO, IN THE BUKHTARMINSKOE RESERVOIR,

L. A. Fedotova.

Vopr Ikhtiol. Vol 11, No 3, p 457-463, 1971.

Identifiers: "Fish management, Bukhtarminskoe reservoir, "Carp, "Chironomidae, Cyprinus carpio, Food, Parasites, USSR.

Biologic investigations were conducted on C. carpio, one of the most important commercial fishes, in the Bukhtarminskoe reservoir in eastern Kazakhstan from 1960-1969. Chironomidae larva were found to be the primary source of food for the carp; however, their food also consisted of

macrophytes and plant and animal detritus. Eight orders of carp parasites were found to be widely distributed in the reservoir. Nevertheless, the rate of infectivity was very low. Recommendations were also made that fishing be limited to individuals at least 45 cm in length, and that fishing be entirely prohibited during spawning from May 15 to the end of June.—Copyright 1972, Biological Abstracts, Inc. W72-12284

TEMPERATURE MICROSTRUCTURE IN CRATER LAKE, OREGON, Oregon State Univ., Corvallis. Dept. of Oceanog-MICROSTRUCTURE IN

raphy. V. T. Neal, S. J. Neshyba, and W. W. Denner. Limnol Oceanogr. Vol 16, No 4, p 695-700. 1971. Illus. Map.
Identifiers: *Crater Lake, *Oregon, Temperature,
Lakes, *Thermal stratification.

Vertical temperature profiles made in Crater Lake with a modified XBT system show that layers of nearly isothermal water, separated by sheets of relatively high temperature gradient, exist in the upper 265 m of the lake. The microstructure was better developed and more persistent in later than in early summer. The relationship between tem-perature microstructure and rate of vertical heat 1972, Biological Abstracts, Inc.
W72-12351

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS,

Geological Survey, Austin, Tex.

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Descriptors: *Reservoirs, *Hydrologic budget, *Water quality, *Texas, Data collections, Hydrologic data, Geology, Water balance, Precipitation (Atmospheric), Inflow, Discharge (Water), Evaporation, Infiltration. Identifiers: *Hubbard Creek Reservoir (Tex).

The results of a water budget and chemical quality of water study of Hubbard Creek Reservoir (Tex-as) are presented. Data collected permitted com-putation of watershed precipitation, inflow and outflow of the reservoir, evaporation, and chemi-cal analysis of water. Small water losses were attributed to saturation of alluvium in the reservoir basin during the initial filling of the reservoir. basin during the initial filling of the reservoir.

Because there are no groundwater aquifers of importance in the watershed, and because the sediments within the drainage basin are relatively impermeable, no large amounts of water are lost by infiltration. During the period 1963-67, about 110,000 acre-feet of water was lost by evaporation. This amount represents about 30% of the capacity of the reservoir at normal operating level. Water-sample analyses from tributaries passing through oil fields indicate that industrial waste contributes to mineralization of the reservoir (Woodard-USGS) W72-12385

SNOW ICE AND ITS SIGNIFICANCE IN COM-PUTING THE THICKNESS OF THE ICE For primary bibliographic entry see Field 02C. W72-12387

2I. Water in Plants

SALINITY AND THE WHOLE PLANT, Adelaide Dept. of Agriculture (Australia). For primary bibliographic entry see Field 03C. W72-11767 SALINITY AND PLANT CELLS, Sydney Univ. (Australia). School of Biological Sciences. For primary bibliographic entry see Field 03C. W72-11768

STUDIES ON THE HABITAT SEGREGATION OF PINUS DENSIFLORA AND P. THUNBERGII. I, (IN JAPANESE), YOSHIGO HABITANIA

Bull Fac Agric Shimane Univ. 3. p 35-39. 1969. En-

glish summary. Identifiers: *Habitat, Moisture, *Pinus densiflora G, *Pinus thunbergii G, Segregation, Slope.

P. densiflora and P. thunbergii are generally segregated but partially overlap. Ridges and upper parts of a hillside are inhabited by P. densiflora. In dry valleys and lower parts of hillsides, both species appear equally. Dry places are inhabited mainly by P. densiflora, but scarcely by P. thunbergii. Both species occur together in moist places.—Copyright 1972, Biological Abstracts, Inc. W72-11813

FURTHER SUGGESTIONS FOR A CLASSIFI-CATION OF SUBTERRANEAN BIOTOPES AND BIOCOENOSES OF THE FRESHWATER FAU-

NA, Limnologische Fluss Station, Schlitz (West Ger-

S. Husmann. Int Rev Gesamten Hydrobiol. Vol 55 No 1 p 115-

129. 1970. English summary.
Identifiers: Biotopes, Ciocenoses, *Classification, *Aquatic animals, Terminology.

The 'attempt at an ecological classification of the interstitial groundwater into characteristic biotopes' (Husmann, 1966) is continued by the unification of terms for ecosystems, biotopes, and biocoenoses. The running water ecosystems 'rbiocoenoses. The running water ecosystems 'rhithrocoen' and 'potamocoen' are contrasted with the ecosystem 'eulimnocoen' (lakes). The ecosystem in groundwater filled spaces of sandy and gravely lake basins is named 'eulimnostygocoen,' the interstitial biotope is named 'eulimnostygon.' The biotopes and biocoenoses can be named more exactly according to the nature of the substrate: 'eulimnostygopsammal,' 'culimnostygopsephal,' 'eulimnostygopsammon,' 'eulimnostygopsephon.' Epigean and endogean biotopes of the ecosystems 'rhithrocoen,' potamocoen' and 'eulimnocoen' are presented as ecological complexes of a higher order. The potamocoen and eluminocen are presented as ecological complexes of a higher order. The stygolimnological methods of classification used here, derived from Thienemann (1925) and Illies (1961), are contrasted with other methods for the classification of underground freshwater biotopes.—Copyright 1972, Biological Abstracts, W72-11817

PHOTOSYNTHETIC RESPONSE BRIGALOW TO IRRADIANCE, TEMPERA-TURE AND WATER POTENTIAL, British Columbia Forestry Service, Victoria. Research Div. R. Van Den Driessche, D. J. Connor, and B. R. Photosynthetica. 5 (3): 210-217, Illus. 1971.

Identifiers: Acacia-Harpophylla-D, Australia, *Brigalow-D, Irradiance, *Photosynthetisis, Water potential, Stomata, Temperature, *X-

A laboratory study was made of effects of irradi-A lacoratory study was made of effects of irradi-ance, temperature, and water potential on photosynthesis in phyllodes of brigalow (Acacia harpophylla F. Muell.), a xerophytic tree from semi-arid regions of subtropical Australia. The mean maximum rate of net photosynthesis (PN), of 13.6 mg CO2 dm-2h-1, was at least as high as PN values for temperate zone woody evergreens, but

Field 02—WATER CYCLE

Group 21-Water in Plants

the temperature for maximum PN, of 26 deg C, was not much higher than the temperature for maximum PN in other species. The ability to main-tain some degree of PN down to water potentials of at least 60 bars was a striking feature of brigalow. PN was closely dependent on stomatal control over the ranges of irradiance, temperature, and plant water potential investigated, and the average minimum value for stomatal resistance to water vapor transfer was 4.5 s cm-1.—Copyright 1972, Biological Abstracts, Inc. W72-11843

VARIATION IN INFRARED REFLECTANCE OF

EUCALYPTUS RADIATA DC, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.

Research.
R. Story, and G. A. Yapp.
Aust J Biol Sci. 24 (5): 945-953, Illus, 1971.
Identifiers: *Eucalyptus-Radiata-D, * *Infrared reflectance, Water stress, *Leaves.

Various workers have reported that green plants which are diseased or in need of water have a lower IR reflectance and consequently a blue image on false color film. The IR reflectance of E. radiata leaves rises as they become dry, and produces no blueness of the false color image. It is suggested that blue images of E. radiata recorded in the field are due to lower reflectance of the IR wavelengths by flowers. Water stress is not likely to be detected on false color film until the plants are visibly affected .-- Copyright 1972, Biological Abstracts, Inc. W72-11851

THE VEGETATION AND ITS DISTRIBUTION ON RIDEAU RIVER ISLAND, OTTAWA, Carleton Univ., Ottawa (Ontario). Dept. of Biolo-

J. L. Cameron, and J. D. H. Lambert. Nat Can. 98 (4): 675-689, Illus, Map, 1971, French summary.

Identifiers: Canada, *Distribution patterns, Flooding, Ice, Islands, Ottawa, *Populus-Balsamifera-D, Rideau River Island, Salix-Nigra-D, Scouring, Spring, Ulmus-Americana-D, *Vegetation.

The vegetational composition of a Rideau River Island was quantitatively determined. Three floristic units were delimited. The exposed south end was dominated by immature Populus balsamifera, the central portion of the island by ma-ture Salix nigra, and the north end by mature Ulmus americana and P. balsamifera. The principal factors governing the composition of these units are the degrees of exposure to the scouring effects of ice and spring flood waters. Succession to more mesic species would require substantial soil development, a process that appears unlikely at present because the flood waters remove most if not all of the accumulated organic material each spring.—Copyright 1972, Biological Abstracts, Inc. W72-11852

THE RESISTANCE TO DESICCATION AND HEAT OF THE ASEXUAL CYSTS OF SOME FRESHWATER PRASINOPHYCEAE,

Culture Centre for Algae, Protozoa, Cambridge (England).

J. H. Belcher

Br Phycol J. 5 (2): 173-177. 1970.

Heteromastix, Monomastix, Pedinomonas, *Prasinophyceae, Pyramimonas, Scherffelia,

Experiments were carried out on 11 clonal cultures representing the prasinophycean genera Heteromastix, Spermatozopsis, Monomastix, Pyramimonas, Pedinomonas and Scherffelia to determine the viability after desiccation of any resting stages, Resistance to dry heat was also tested. The results are discussed with reference to natural conditions.-Copyright 1972, Biological Abstracts, Inc. W72-11868

WAX FILAMENTS ON SORGHUM LEAVES AS SEEN WITH A SCANNING ELECTRON MICROSCOPE,

Duke Univ., Durham, N.C. For primary bibliographic entry see Field 03F. W72-12343

PLANT MOISTURE STRESS PATTERNS IN EU-ROTIA LANATA AND ATRIPLEX CONFER-

TIFOLIA, Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center. N. E. West.

Northwest Science, Vol. 46, No. 1, p 44-51, 1972. 2

Descriptors: *Xerophytes, *Ecological distribution, "Soil-water-plant relationships, "Moisture stress, "Halophytes, Saline soils, Rainfall, Plant physiology, Soil moisture, Biological communi-ties, Arid lands, Diurnal, On-site data collections,

Identifiers: *Soil water potential, *Plant water

The natural distributions of plants might be a reflection of their relative abilities to withstand low water potentials. The effects of soil moisture on xerophyte growth are difficult to interpret because plant moisture stress is a function of soil salinity as well as soil moisture and because many desert shrubs grow at soil moisture levels that are below the permanent wilting percentage for agronomic species. Using a pressure bomb, diurnal and seasonal internal plant moisture stress was measured in individuals of Eurotia lanat and Atriplex confertifolia in 3 different stands in Cur-Valley north of the Great Salt Lake: a pure Eurotia stand, a mixed stand and a pure Atriplex stand. The highest moisture stress values were recorded in early to mid-afternoons of the driest, hottest days. Stress values were immediately reduced by rainfalls of 8 mm or more. Species distribution differences could not be explained by plant moisture stress differences. Possible reasons for this are discussed. (Casey-Arizona) W72-12344

THE INFLUENCE OF POTASSIUM ON THE TRANSPIRATION RATE AND STOMATAL OPENING IN TRITICUM AESTIVUM AND PISUM SATIVUM,

Lund Univ. (Sweden). Dept. of Plant Physiology. For primary bibliographic entry see Field 02D. W72-12345

DIURNAL ACTIVITY IN A SMALL DESERT RODENT.

Tel-Aviv Univ. (Israel). Dept. of Zoology. A. Shkolnik. International Journal of Biometeorology, Vol 15, No 2-4, p 115-120, 1971. 4 fig, 1 tab, 5 ref.

*Xerophilic animals, physiology, *Animal behavior, *Biological communities, *Water balance, Ecological distribution, Mammals, Arid lands, Temperature, Heat balance, Diurnal.
Identifiers: *Thermoregulation.

Two Murid rodents of the same genus, Acomys cahirinus (golden spiny mouse), Acomys russatus (common spiny mouse) are widely distributed in the same desert habitats in Israel, and are similar in their morphology and life history. They differ only in their activity patterns: the common spiny mouse is strictly nocturnal while the golden spiny mouse is active during the day. Two adjoining stone piles containing mixed populations of these rodents were studied. In one pile, mice were trapped, all common spiny mice caught were removed and all golden spiny mice caught were released. The other pile served as a control, with all mice caught being released. The trapping resulted in a major change in golden spiny mice behavior: individuals of the species became active and were trapped during the night. It appears that the golden spiny mice were temporally displaced by their more vigorous kindred and that they are physiologically more adaptable to the desert than the common spiny mice. The golden spiny can survive over a higher temperature range and it generates less metabolic heat. The animal has an exceptionally high evaporation rate which allows it to dissipate, at temperatures above 30 degrees C, over one-third of the heat it generates. The high evaporation is made possible by a water balance achieved through a very efficient kidney and a diet of succulent snails. Physiological thermoregula-tion is supplemented by behavioral avoidance of direct sunlight. (Casey-Arizona) W72-12359

TOPOGRAPHIC RELATIONS OF VEGETA-TION AND SOIL IN A SOUTHEASTERN ARIZONA GRASSLAND, Agricultural Research Service, Tucson, Ariz.

Southwest Watershed Research Center For primary bibliographic entry see Field 04A. W72-12364

RESEARCH ON SUBTERRANEAN WATERS: THE COLONIZATION OF A WATER DRAINAGE CHANNEL LOCATED IN THE PERMANENT CIRCULATION ZONE BY HAR-PACTICOIDEA.

Ann Speleol, Vol 26, No 1, p 107-133, 1971, Illus,

English summary.
Identifiers: Channels, Circulation, Colonization, Drainage, *Harpacticoidea, *Subterranean waters.

Harpacticoidea show a very peculiar way of colonization in the permanent circulation zone. The distribution of 8229 individuals shows the importance of the interstitial lacunar space for hypogeous species and makes conspicuous a passive transfer of epigeous species along the subterranean stream.--Copyright 1972, Biological Abstracts, Inc. W72-12365

SPECIFIC STRUCTURAL ALTERATIONS OF THE CHLOROPLASTS OF SPINACH LEAVES BY NEUTRAL SALTS, California Univ., Davis. Dept. of Food Science

and Technology.

For primary bibliographic entry see Field 03C.

W72-12366

THE FISHES OF THE WOLF RIVER, TENNES-SEE AND MISSISSIPPI,

Memphis State Univ., Tenn.
D. W. Medford, and B. A. Simco.

J Tenn Acad Sci, Vol 46, No 4, p 121-123, 1971, Il-

Identifiers: Fish, Habitat, *Mississippi, Species, *Tennessee, *Wolf River.

The Wolf River in Tennessee and Mississippi was studied between July 18, 1967, and July 13, 1968. Fifty-two spp. of fish were collected in this study and observations are reported regarding the habitats in which each species was found.—Copyright 1972, Biological Abstracts, Inc. W72-12368 DESICCATION TOLERANCE IN THREE RACES OF AMBYSTOMA TIGRINUM IN NORTH DAKOTA, Dept. of Fisheries and Wildlife. Oreg. State Univ.,

Corvallis.

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D. W. Larson. Copeia. 4 p 743-747. 1971. Illus. Map. Identifiers: *Moisture stress, *Adaptation, Resistance, Ambystoma tigrinum, Ambystoma tigrinum diaboli, Ambystoma tigrinum melanostictum, Ambystoma tigrinum tigrinum, Desiccation, North Dakota.

The probable relationship between the east-west moisture gradient and the distribution of 3 A. moisture gradient and the distribution of 3 A. tigrinum races suggests possible specializations that might be of adaptive value under varying conditions of environmental moisture in North Dakota. The response of A. t. tigrinum and A. t. diaboli to desiccation is similar, and this supports the moisture relationships apparent in the state. The ability of A. t. melanostictum to tolerate greater water loss may be due to physiological adaptations which are selective in habitats where water availability topess a continual threat—Convwater availability poses a continual threat.--Copyright 1972, Biological Abstracts, Inc. W72-12383

2J. Erosion and Sedimentation

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 02E. W72-11866

EFFECTS OF CONSERVATION TECHNIQUES ON YIELD, For primary bibliographic entry see Field 03B.

A THEORETICAL AND EXPERIMENTAL STUDY OF CLIMBING-RIPPLE CROSS-LAMINATION, WITH A FIELD APPLICATION TO THE UPPSALA ESKER, Uppsala Univ. (Sweden). Dept. of Physical Geography. J. R. L. Allen.

W72-11909

Geografiska Annaler, Vol 53A, No 3-4, p 157-187, 1971. 17 fig, 6 tab, 69 ref.

Descriptors: *Ripple marks, *Sedimentary structures, *Glacial drift, *Beds (Stratigraphic), Currents (Water), Sediment transport, Bed load, Allu-

Identifiers: *Eskers, *Sweden, *Cross-lamination (Stratigraphy).

The angle of climb of ripples in climbing-ripple cross-lamination depends theoretically on the net rate of deposition on the bed, the bed-load transport rate in the absence of net deposition and a deposition rate difference between upstream and downstream ripple faces. Theoretically, the local size-sorting in cross-laminated deposits becomes less marked as the angle of climb increases. less marked as the angle of climb increases. With increasing steepness of climb, the internal structure of the deposit changes from cross-laminae filling erosional troughs to laminae that are very continuous laterally. These various predictions are broadly confirmed in a series of laboratory flume experiments covering a 300-fold range of the angle of climb. Additional confirmation of the prediction concerning local size-sorting is obtained from measurements made on cross-laminated sands in the Uppsala esker at Loftsalot. Making use of a further theoretical relationship enabling mean flow further theoretical relationship enabling mean flow velocity to be calculated from sediment mean size, rates of sediment deposition were estimated for beds with climbing-ripple cross-lamination in the Uppsala esker. The flows depositing the beds ap-pear to have varied in discharge on a time scale

varying between several hours and a few tens of hours. Such a periodicity is consistent with what is known of discharge fluctuations in modern glacial streams. (Knapp-USGS) W72-11976

SEDIMENTATION OF WILLIAMS RESER-VOIR, SANTA CLARA COUNTY, CALIFOR-

VOIR, SANTA CLARA COUNTY, CALIFOR-NIA, Geological Survey, Menlo Park, Calif. J. R. Ritter, and W. M. Brown, III. Geological Survey Open-file Report, April 6, 1972. 26 p, 8 fig, 6 tab, 11 ref.

Descriptors: "Sedimentation, "Reservoirs, "California, "Forest fires, "Sediment yield, Soil erosion, Reservoir silting, Sediment load, Data collections, Hydrologic data.

Identifiers: "Williams Reservoir (Calif), Santa Clara County (Calif).

Fifty-two acre-feet of sediment was deposited in Williams Reservoir, California, between 1913 and 1971. From calculations of the sediment yields in other nearby drainage basins in Santa Clara County, it was determined that 24 to 38 acre-feet of sediment would have been transported to Williams Reservoir between 1961 and 1971 under natural conditions. The difference (14 to 28 acre-feet) is conditions. The difference (14 to 28 acre-feet) is probably a consequence of increased sediment yield due to a fire that destroyed much of the vegetation in the drainage basin in 1961. (Knapp-USGS) W72-11977

DEBRIS FALLS AT THE FRONT OF ARAPAHO ROCK GLACIER, COLORADO FRONT RANGE, U.S.A.,

Ohio State Univ., Columbus. Dept. of Geology.

Geografiska Annaler, Vol 53A, No 2, p 86-91, 1971. 4 fig, 2 tab, 4 ref. NSF Grant GP-2822.

Descriptors: *Rock glaciers, *Glaciers, *Colorado, *Debris avalanches, Mass wasting, Erosion, Movement, Geomorphology, Regimen, Ice, Sediment transport.
Identifiers: *Arapaho Rock Glacier (Colo).

Debris falls at the front of Arapaho Rock Glacier in Colorado Front Range were identified by photography from a monumented photo site over a 9-year period, 1961-1970. Volume of fallen debris gives annual movement of 5.3 cm/yr and discharge of about 211 cu m/yr. Direct correlation exists between surface movement of the whole rock glacier and debris-fall activity. Debris falls are spasmodic; pathways continue active for years, but eventually clog and are idle. Old inactive routes are cleared out and reactivated. Talus finally accumulates at the base, is overridden and napp-USGS)
W72-11980

SOME ASPECTS OF GRANITE WEATHERING AND TOR FORMATION ON DARTMOOR, EN-GLAND,

London Univ. (England). Dept. of Geography; and Bedford Coll., London (England). M. J. Eden, and C. P. Green. Geografiska Annaler, Vol 53A, No 2, p 92-99, 1971. 3 fig. 3 tab, 23 ref.

Descriptors: *Weathering, *Erosion, *Granites, *Soil formation, *Geomorphology, Topography. Identifiers: *Dartmoor (England), *Tors.

The products of weathering and pneumatolytic al-teration on the granite of Dartmoor in southwestern England are described, and the relation of the weathered granite to the tors of the area is discussed. Textural and mineral investigations distinguish between the products of alteration and

those of weathering, and the weathering resembles sandy weathering products on granite elsewhere in Europe. A deeply weathered zone differs in character from zones of deep weathering described in the humid tropics. Field seismic investigations suggest that the deep weathering on Dartmoor may have been confined to the margin of the granite and to the main river valleys. The tors of the Dartmoor granite were exhumed from the zone of deep weathering. (Knapp-USGS) W72-11981

ICE CORED MOUNDS AND PATTERNED GROUND, SOUTHERN BANKS ISLAND, WESTERN CANADIAN ARCTIC, Ottawa Univ. (Ontario). Dept. of Geography. For primary bibliographic entry see Field 02C. W72-11982

ICE CORED MORAINE FORMATION AND DEGRADATION, DONJEK GLACIER, YUKON TERRITORY, CANADA, Ottawa Univ. (Ontario). Dept. of Geography. For primary bibliographic entry see Field 02C. W72-11984

TEMPERATURE EFFECTS IN LOW-TRAN-SPORT, FLAT-BED FLOWS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. B. D. Taylor, and V. A. Vanoni. Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9105, p 1427-1445, August 1972. 10 fig, 5 tab, 14

Descriptors: *Sediment transport, *Bed load, *Water temperature, Roughness (Hydraulic), Streamflow, Discharge (Water), Hydraulic models, Model studies.

A 15 to 25 deg reduction in water temperature in an alluvial stream at constant discharge can effect relatively large changes in sediment discharge, and bed geometry and roughness. However, in streams bed geometry and roughness. However, in streams the temperature effects on the various flow parameters are interrelated. In an attempt to untangle the temperature effects on sediment discharge close to the bed without introducing the complications of suspended load transport and nonplanar bed geometry, a bed was artificially flattened, and the bed shear stresses were near those necessary to produce incipient particle transport so that all sediment transport was by rolling and sliding along the bed. The bed materials in these experiments ranged from fine silica sand rolling and sliding along the bed. The bed materials in these experiments ranged from fine slica sand to coarse, synthetic clay-aggregate particles approximately 18.5 mm in diameter. In flat-bed flows where all of the sediment discharged moves by rolling and sliding along the bed the effects of a change in water temperature on sediment discharge depends on the roughness condition of the bed. If the bed is in the lower transition range an increase in water temperature (velocity and an increase in water temperature (velocity and depth constant) will cause an increase in sediment discharge; if the bed is in the upper transition range an increase in temperature will cause a decrease in sediment discharge; and if the bed is hydrodynamically rough sediment discharge does not change with temperature. (Knapp-USGS) W72-11986

VOLUME WEIGHT OF RESERVOIR SEDI-MENT IN FORESTED AREAS, Forest Service (USDA), Ogden, Utah. Intermoun-tain Forest and Range Experiment Station.

tain Forest and range Experiment station.

W. F. Megahan.

Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY8, Paper
9129, p 1335-1342, August 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Reservoir silting, *Organic matter, *Water quality, *Forests, *Sedimentation, Density, Ecology, Variability, Sediments, Provenance.

Field 02-WATER CYCLE

Group 2J—Erosion and Sedimentation

Volume weights (weight per unit volume) of sediments deposited in small reservoirs on forested watersheds vary considerably even though watersheds have contiguous drainage divides and appear to be grossly similar. Further, volume weights differ greatly within a given reservoir and the variation cannot be explained simply by differences in particle settling velocities. The per-centage of organic matter in sediment samples is a reliable basis for estimating volume weight, better than approaches that relate volume weight to sedi-ment particle sizes. The volume weights of sediment vary with mineral particle-size distribution, primarily because the packing characteristics of particles dictate that the volume of voids decreases as particle size increases. However, submerged organic matter can strongly affect the volume weight of sediment because the specific gravity of organic components is considerably less than that of mineral sediments. In addition, organic particles and associated organic acids probably tend to aggregate sediments, especially fine sediments, by binding and flocculation phenomena. Organic sediments can help determine water quality. Consequently, an added dimension must be considered when evaluating the impacts of changes in land use of forested watersheds. (Knapp-USGS)

LIQUID CRYSTALS IN QUICK CLAYS, Swedish Inst. for Surface Chemistry, Stockholm. For primary bibliographic entry see Field 02G. W72-12013

SOIL EROSION AND EROSION CONTROL (EROZIYA POCHIV I MERY BOR'BY S NEY), For primary bibliographic entry see Field 04D. W72-12017

ENVIRONMENTAL STUDIES OF MERCURY AND OTHER ELEMENTS IN COAL AND LAKE SEDIMENTS AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS, Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 05A.

INTERPRETATION OF AERIAL PHOTO-GRAPHS FOR GEOMORPHOLOGICAL GRAPHS FOR RESEARCH.

For primary bibliographic entry see Field 07C. W72-12036

MEASUREMENT OF LATERAL EROSION AT PROPOSED RIVER CROSSING SITES OF THE ALASKA PIPELINE, Geological Survey, Anchorage, Alaska.

I. Brice. Geological Survey Alaska District Report, 1971. 39

p, 17 fig. Descriptors: *Erosion rates, *Alaska, *Stream erosion, *Meanders, *Pipelines, Bank erosion, Channel erosion, Erosion, Geomorphology, Topography, Photogrammetry, Terrain analysis, *Aerial photography. Identifiers: *Alaska pipeline.

W72-12033

Lateral erosion rates were studied at proposed pipeline crossings of Alaskan rivers by comparison of aerial photographs. Most of the crossing sites were also examined in the field, in too brief a sites were also examined in the field, in too brief a time to permit quantitative measurements but long enough to be of much assistance in interpretation of the aerial photographs. Where the proposed Alaskan pipeline is to be buried beneath stream channels, the design depth of burial should be greater than the estimated maximum depth of scour in the main channel of the stream. For each crossing site, the distance of lateral migration by the river was measured by precise superposition and matching of aerial photographs taken about 20 years apart. (Knapp-USGS) W72-12040

FLOW CHARACTERISTICS WITHIN A CHANNEL BOUNDARY OF COARSE MATERIALS, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 08B. W72-12106

HYDRAULIC STRUCTURE FOR RESISTING WAVE ACTION, For primary bibliographic entry see Field 08A. W72-12128

A DEVICE FOR SAMPLING IMMEDIATELY ABOVE THE SEDIMENT-WATER INTERFACE, Woods Hole Oceanographic Institution, Mass.

K. L. Smith, Jr. Limnol Oceanogr. Vol 16, No 4, p 675-677. 1971. Illus.

Identifiers: *Sampling, *Sediment-water inter-

A simple inexpensive device is described for sampling the water column immediately above the sediment surface. It consists of a bottom sled, hose, and deck pump and is easily operated from any stable platform.—Copyright 1972, Biological Abstracts, Inc. W72-12299

2K. Chemical Processes

THE CARBON ISOTOPIC COMPOSITION AND THE CONCENTRATION OF THE DISSOLVED ANORGANIC CARBON IN THE ATLANTIS II DEEP BINES/RED SEA, Bundesanstalt fuer Bodenforschung, Hanover

(West Germany). M. Schoell, and W. Stahl.

Earth and Planetary Science Letters, Vol 15, No 2, p 206-211, June 1972, 2 fig, 1 tab, 12 ref.

Descriptors: *Brines, *Carbon, *Stable isotopes, *Hydrothermal studies, Geochemistry, Hot springs. Identifiers: *Red Sea. Water

The Atlantis II Deep brines were investigated what respect to dissolved anorganic carbon. The C-12/C-13 ratios change continuously from sea water (-1.5 parts per thousand PDB) to the 49 deg C brine (-4.2 to -3.8 parts per thousand PDB). The 59 deg C brines have a uniform isotopic composition (-7.0). The Atlantis II Deep brines were investigated with brine has a uniform isotopic composition (-7.0 parts per thousand) throughout the whole brine pool. The anorganic carbon concentration data show a similar change from sea water 946 ml/liter) show a similar change from sea water 346 mi/liter) to the 49 deg C brine (55-7° ml/liter). The 59 deg C brine revealed concent ions of 48 ml/liter between a depth of 2060-2100 dbar. (Knapp-HSGS) W72-11749

GEOCHEMISTRY OF MELTWATER STREAMS FROM NINE ALASKAN GLACIERS, Memorial Univ. of Newfoundland, St. John's. Dept. of Geology. For primary bibliographic entry see Field 02C. W72-11751

SALINITY AND WATER USE. For primary bibliographic entry see Field 03C. W72-11755

THE GEOCHEMISTRY OF UNDERGROUND

Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of Mineralogy. For primary bibliographic entry see Field 03C. W72-11756

THERMODYNAMICS OF SALINE WATER, Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div. of Applied Chemistry. For primary bibliographic entry see Field 03C. W72-11758

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES, Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science. For primary bibliographic entry see Field 03C. W72-11760

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS, Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Soils. For primary bibliographic entry see Field 03C. W72-11762

SALINITY AND THE WHOLE ANIMAL, Adelaide Univ. (Australia). Waite Agricultural Research Inst. For primary bibliographic entry see Field 03C. W72-11765

SALINITY AND ANIMAL CELLS, New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology. For primary bibliographic entry see Field 03C. W72-11766

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY, ASTEL 15 OF INORGANIC MERCURY, National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. For primary bibliographic entry see Field 05A. W72-11797

USE OF A MAGNETIC TAPE CASSETTE RECORDER WITH AN ON-LINE GC DATA Eastman Kodak Co., Rochester, N. Y. Industrial

For primary bibliographic entry see Field 07B. W72-11930

A NEW COMPUTING INTEGRATOR FOR CHROMATOGRAPHY, Vidar Corp., Mountain View, Calif. For primary bibliographic entry see Field 07B. W72-11932

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12002

HYDROGEN PEROXIDE CONTENT OF RIVER WATER AND A METHOD FOR DETERMINING

IT, Nauk SSSR, Moscow. Institut Biologii Akademiya Vnutrennykh Vod. For primary bibliographic entry see Field 05A. W72-12016

SOLUBILITY OF HYDROCARBONS IN WATER UNDER STRATAL CONDITIONS (O RAST-VORIMOSTI UGLEVODORODOV V VODE V

VORIMOSTI UGLEVODORODOV V VODE V PLASTOVYKH USLOVIYAKH), Akaemiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh. T. P. Zhuze, V. I. Sergeyevich, V. F. Burmistrova, and Ye. A. Yesakov. Akademiya Nauk SSSR Doklady, Vol 198, No 1, p 206-209, 1971. 3 fig, 2 tab, 19 ref.

Descriptors: *Geochemistry, *Water chemistry, *Water types, *Organic compounds, Solubility, Saturation, Gases, Aqueous solutions, Elec-trolytes, Salinity, Pressure, Temperature, Inor-ganic compounds, Colloids, Emulsions, Soaps, Surfactants, *Oil.

ganic compounds, Surfactants, *Oil. Identifiers: USSR, *Hydrocarbons, *Aromatic hydrocarbons, Benzene, Toluene, Methylhydrocarbons, Benz cyclohexane, Isobars.

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To assess the role of water in the formation and destruction of oil deposits, solubilities of hydrocarbons were investigated in pure water, in water saturated with gases below 330 atm, and in mineralized water, at temperatures between 30 and 150 deg C. Solubilities of benzene, toluene, and methylcyclohexane in pure water increase with temperature, which is especially pronounced in aromatic hydrocarbons which dissolve in water better than other hydrocarbons with the same number of carbon atoms in the molecule. Saturation of the water with gas generally reduces the solubility of liquid hydrocarbons, depending on the hydrocarbon, gas, temperature, and pressure. Solubility of benzene in water decreases successively in water saturated with nitrogen, helium, methane, carbon dioxide, and propane. Higher saturation of the water with gas leads to a greater drop in the solubility of the hydrocarbon. Solubili drop in the solubility of the hydrocarbon. Solubility of a mixture of hydrocarbons in gas-saturated water is less than in pure water. Between 80 and 145 deg C, solubility of toluene in calcium-chloride water was 35%-45% lower than that in pure water. Solubility of toluene in sodium-bicarbonate water at 115 to 125 deg C was similar to that in pure water but at 130 to 145 deg C was much lower. The presence of liquid hydrocarbons in water increases the solubility of gases and may account for the re-ported higher gas content of groundwater in con-tact with oil, as compared with the backgound values in these waters. (Josefson-USGS) W72-12022

USE OF ATOMIC ABSORPTION SPECTROSCOPY IN THE DETERMINATION OF MICRO G/ LITER CONCENTRATIONS OF NA+, K+, CA2+, AND MG2+, Cold Regions Research and Engineering Lab., Hanover, N.H.

Army Cold Regions Research and Engineering Laboratory Special Report 174, June 1972. 5 p, 2

Descriptors: *Spectroscopy, *Flame photometry, *Trace elements, *Water analysis, Chemical anal-ysis, Spectrophotometry. Identifiers: *Atomic absorption spectroscopy.

Routine analyses of concentrations of Na, K, Ca and Mg may be made by atomic absorption spectroscopy, with good sensitivity down to 2 micrograms/liter. Standard solutions can be kept for relatively long periods of time with no change in concentration or interference between cations. Relative deviation of absorption increases with decreasing concentration, but never exceeds 100% even at 2 micrograms/liter, so detection limits can even at 2 micrograms/liter, so detection limits can be assured to this level. (Knapp-USGS) W72-12025

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

For primary bibliographic entry see Field 01B. W72-12099

DETERMINATION OF NITRILOTRIACETIC ACID (NTA) WITH ION-SELECTIVE ELEC-TRODES. State Univ. of New York, Buffalo. Dept. of

Chemistry. ry bibliographic entry see Field 05A. MECHANISTIC STUDIES ON THE VALINO-MYCIN-BASED POTASSIUM ELECTRODE, State Univ. of New York, Buffalo. Dept. of ary bibliographic entry see Field 05A. W72-12111

ION-ELECTRODE STUDY OF THE CALCIUM--ADENOSINE TRIPHOSPHATE SYSTEM, State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12114

ION-SELECTIVE MEMBRANE SULFATE ELECTRODE, State Univ. of New York, Buffalo. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W72-12115

HODINE CONTENT IN MILK AND WATER IN WROCLAW VOIVODESHIP, Instytut Zootechniki, Krakow (Poland). Z. Ewy, H. Pyska, and H. Styczynski. Rocz Nauk Roin Ser B Zootech. Vol 91, No 3, p 335-346. 1969. Illus. Maps. English summary. Identifiers: *Iodine, Milk, Poland, *Nutrient requirements. requirements.

Milk and water samples from 26 dairy coopera-tives were analyzed for I content. On the basis of the sampling, the supplementation of cattle diets with iodized salt was recommended.--Copyright 1972, Biological Abstracts, Inc. W72-12167

INHERENT ERRORS IN PERPENDICULAR AL-

INHERENT ERRORS IN PERPENDICULAR AL-LOCATION OF OVERLAPPING CHROMATO-GRAPHIC PEAKS, Osaka Univ. (Japan). Dept. of Applied Chemistry. K. Kishimoto, H. Miyauchi, and S. Musha. Journal of Chromatographic Science, Vol. 10, No. 4, p 220-223, April 1972. 5 fig, 5 ref.

Descriptors: *Statistical methods, Mathematical studies, Equations, Methodology, Quality control, Numerical analysis, Separation techniques, Pollutant identification, Digital computers, Data processing, *Chromatography. Identifiers: *Chromatographic peaks, *Errors, *Perpendicular allocation method, Error curves.

An investigation has been designed to mathemati-cally evaluate the inherent errors of the perpencally evaluate the inherent errors of the perpendicular allocation method of resolving composite wave forms in chromatographic analysis. It has been determined that the error increases with a decrease in the separation factor and the sign of the error is determined by the relative magnitude of the two peak heights. The tendency toward bias of the error to one side of the sign becomes pronounced as the first peak becomes sharper. Only the form of the error curves calculated from Only the form of the error curves calculated from appropriate equations and data is shown and correction techniques are not provided. However, it is shown via numerical evaluation that the errors strangely depend upon the shape of the peaks. (Mackan-Battelle) W72-12168

THE TRACE ELEMENTS AND THEIR IM-PORTANCE TO LIFE, Universitaet des Saarlandes, Homburg (West Ger-

many). Medizinische Fakultaet.

Rev Port Quim. Vol 12, No 4, p 193-201. 1970. Il-Identifiers: *Nutrient requirements, *Trace ele-ments, Environment, Life.

Fe, Zn, F, Cu, Mn, I, Co and Mo are necessary for life. Of possible importance are As, Cr, Ni, Se, Si,

V and B. Al, Br, Cs, Hg, Pb, Rb and Sr are unavoidable in the environment. Radioelements present in the environment include Cs137, Sr90, Sr89, Ru106, Nb95, Ce144, Pm147 and Zr95.—Copyright 1972, Biological Abstracts, Inc. W72-12346

STRUCTURE OF WATER, For primary bibliographic entry see Field 01A. W72-12372

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 02H. W72-12385

2L. Estuaries

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER, Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France). For primary bibliographic entry see Field 05B. W72-11743

THE TRANSPORT OF SALT IN RIVERS AND ESTUARIES, New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 03C.
W72-11764

DISTRIBUTION AND ABUNDANCE OF PLANK-TONIC CRUSTACEA IN STURGEON BAY AND SHAWANAGA INLET, GEORGIAN BAY, ON-

Waterloo Univ. (Ontario). Dept. of Biology J. C. H. Carter.

Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 79-83, January 1972. 3 fig, 1 tab, 7

pescriptors: *Crustaceans, *Distribution patterns, *Zooplankton, Water temperature, Electrolytes, *Seasonal, Marine animals, Plankton nets, Copepods, Conductivity, Physical properties, Waterfleas, Water quality, Aquatic populations, Sampling, Temporal distribution, Daphnia. Identifiers: *Macroinvertebrates, *Sturgeon Bay, Georgian Bay, Daphnia ambigua, Diaptomus reighardi, Diaptomus sicilis, Limnocalanus macrurus, Eubosmina coregoni, Bosmina longirostris, Tropocyclops prasinus mexicanus, Leptodora kindtii, Polyphemus pediculus, Sida crystallina, Diaphanosoma leuchtenbergianum, Holopedium gibberum, Daphnia longiremis, Daphnia galeata mendotae, Daphnia retrocurva, Ceriodaphnia lacustris, Ceriodphnia quadrangula, Chydorus sphaericus, Epischura lacustris, Eurytemora affinis, Diaptomus minutus, Diaptomus ashlandi, Diaptomus oregonensis, Cyclops scutifer, Cyclops vernalis, Cyclops bicuspidatus thomasi, Mesocyclops edax.

The distribution, numbers, and seasonal succession of planktonic crustaceans in a semi-enclosed sion of planktonic crustaceans in a semi-enclosed bay and a long open inlet were studied during a 9-month period in 1970-71. Crustacean plankton was sampled at 6 stations, 2-5 km apart and in water 9-13 m deep, using a conical nylon plankton net hauled from near bottom to the surface at a rate of about 0.5 m/sec. Water temperature was taken during the same sampling period with a Whitney underwater thermistor (1 m to bottom) and water samples, collected from mid-depth and later. samples collected from mid-depth and later analyzed for conductivity at 25 C. Most species were found at all stations on at least some occa-

Field 02-WATER CYCLE

Group 2L—Estuaries

sions in 1970, although some differences in periods of maximum abundance between stations, probably related to temperature, were noted Daphnia ambigua and Diaptomus reighardi were confined to the inner stations and Limnocalanus confined to the inner stations and Limnocalanus macrurus and Diaptorius sicilis were absent during periods of highest water temperatures. Eubosmina coregoni, although found throughout the system in February 1971, was restricted to the outer stations in 1970. A marked late-summer drop in populations of all species except Bosmina longinostris and Tropocyclops prasinus mexicanus in 1970 might have been due to either normal seasonal fluctuations or heavy predation by planktivorous fish. (Holoman-Battelle)

ECOLOGICAL STUDIES ON MACROINVER-TEBRATE POPULATIONS ASSOCIATED WITH POLLUTED KELP FORESTS IN THE NORTH

Durham Univ. (England). Dept. of Botany. For primary bibliographic entry see Field 05C. W72-11854

ENVIRONMENTAL CHANGES ASSOCIATED WITH A FLORIDA POWER PLANT,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 05C.

MICROFLORA IN SUPRALITTORAL ROCKPOOLS IN A COASTAL AREA SOUTH OF BERGEN, NORWAY, Bergen Univ. (Norway). Biological Station.

Tor Saugestad.

Sarsia. 46. 79-96. Illus. 1971.

Sarsia. 46. /9-90. mus. 1971. Identifiers: "Bergen (Norway), "Brachiomonas-Submarina, Coastal areas, Englenoids, Littoral, "Microflora, "Oxyrrhis-Marina, Pools, Rock,

The microflora in 58 supralittoral rockpools in the archipelago outside the Biological Station, Espegrend was studied during shorter periods of summer-autumn 1962 and spring-summer 1963. Water samples from the pools were centrifuged and the sedimented microflora was studied in a and the sedimented microscope. The salinity in each sample was determined. Data on depth and area of the pools are presented. The pools were classified accoring to the rockpool system of Levander, with some modifications. Of the pools, 44% had a predominant marine influence and 32% of the pools, and the pools of the pools, and the pools of the pools. a predominant limnetic influence. The rest of the pools (24%) showed transitions between these 2 pools (24%) showed transitions between these 2 groups, due to variations in the marine influence in the 2 yr. Only 10% of the limnetic pools could be classified as rainwater pools. Chlorophyceans were recorded once or more in 48 pools while dinophyceans and euglenophyceans were recorded in 40 and 29 pools, respectively. The wide distribution of chlorophyceans and dinophyceans was mainly due to the prevalence of single species, Brachiomonas submarina and Oxyrthis marina, respectively. Few of the microflora species showed preference for one pool type only. Roughly, the microflora could be divided into a euhaline, limnetic, and mixohaline category. The haline, limnetic, and mixohaline category. The microflora in the Espegrend pools was compared with records from other areas, mainly the Baltic. with records from other areas, mainly the Baltic. Species found in the Espegrend pools with their main distribution in salinities higher than 5% seem not to inhabit rockpools in the Baltic area.—Copyright (c) 1972, Biological Abstracts, Inc. W72-11883

CHANNEL CHARACTERISTICS IN A MEAN-

DERING TIDAL CHANNEL: CROOKED RIVER, FLORIDA, Wisconsin Univ., Milwaukee. Dept. of Geography; and Wisconsin Univ., Madison. Dept. of Geology and Geophysics.

For primary bibliographic entry see Field 02E. W72-11983

A LAGRANGIAN METHOD FOR PREDICTING A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, MARIN COUNTY, CALIFORNIA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W72-11985

MATHEMATICAL MODEL OF RIVER

HOOGHLY, Manchester Univ. (England). For primary bibliographic entry see Field 02E. W72-11994

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION

Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 05B. W72-12057

RESIDUES IN FISH, WILDLIFE, AND ESTUA-

Bureau of Fisheries and Wildlife Service, Sacramento, Calif. Div. of River Basin Studies. For primary bibliographic entry see Field 05B. W72-12077

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

For primary bibliographic entry see Field 05B. W72-12084

BIOLOGY OF ALABAMA ESTUARINE AREAS-COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY, Alabama Marine Resources Lab., Dauphin Island. MEXICO

H. A. Swingie.

Available from the National Technical Informa-tion Service as COM-72-10265, \$3.00 in paper copy, \$0.95 in microfiche. Alabama Marine Resources Bulletin, No. 5, August 1971. 123 p, 1 fig, 58 tab, 80 ref, 1 append.

Descriptors: *Alabama, *Estuaries, *Sampling, *Fish, *Invertebrates, *Plankton, *Trawling, *Nets, Distribution patterns, Areal, Seasonal, Oysters, Density.
Identifiers: Historical fisheries statistics.

An inventory was conducted in the estuaries of Alabama. Monthly samples were taken from January 1968 through March 1969 at twenty trawl stations, five seine stations and four plankton stations. One hundred and sixty-two species of fishes and forty-four species of invertebrates were col-lected. Areal and seasonal distributions of the species are presented along with data on the density of oysters on the public reefs. Historical fisheries statistics are reviewed. (Ensign-PAI)

GENERAL THEORY OF SELF-PURIFICATION IN THE SEA, (THEORIE GENERALE DE L'AU-TO-EPURATION DE LA MER),. Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France). For primary bibliographic entry see Field 05G. W72-12095

BIG BEEF ESTUARY PHYTOPLANKTON AND BACTERIA STUDIES 1969, 1969, Washington Univ., Seattle. For primary bibliographic entry see Field 05C.

RAPID RECOVERY OF ESCHERICHIA COLI

FROM ESTUARINE WATER, Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit. For primary bibliographic entry see Field 05B. W72-12178

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L-'INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969), Padua Univ. (Italy). Instituto di Igiene. For primary bibliographic entry see Field 05B. W72-12206

ESCAPEMENT LEVELS AND PRODUCTIVITY OF THE NUSHAGAK SOCKEYE SALMON RUN FROM 1908 TO 1966, Washington Univ., Seattle. Coll. of Fisheries. Ole A. Mathisen. US Fish Wild Serv Fish Bull. Vol 69, No 4, p 747-

763. 1971. Illus. Maps. Identifiers: *Alaska, Decline, Escapement, Nushagak, Productivity, Run, Salmon, *Sockeye, Spawner, *Bristol Bay.

Since the inception of a commercial fishery for sockeye salmon in the Nushagak District, Bristol Bay, Alaska, the annual yields have followed a definite pattern. Catches increased during a reladefinite pattern. Catches increased during a relatively short development phase of the fishery, then stabilized for some years and then declined in 2 steps separated by periods of relative stability. For years the cause of the decline had been thought to be overfishing, and various measures of curtailment had been placed upon the fishing industry. Evidence is presented that the average escapement or the potential egg deposition remained about the same during each of 3 periods (1908-1919, 1925-1945, and 1946-1966); hence the diminution in the runs was due not to lack of diminution in the runs was due not to lack of spawners but to a decline in the rate of return per spawner. So that the cause or causes of the pres spawner. So that the cause or causes of the present low reproductive potential can be ascertained, the effects of fishing on the stocks of salmon must be examined. Besides removing part of the run, the yearly commercial fishing operation may have altered either the age composition or the distribution of the escapement. Available historical records were examined for evidence of these types of changes but largely with a precitive result; there. changes but largely with a negative result; therefore, the y hypothesis was advanced that the observed declining rate of return per spawner is caused by a declining basic productivity of the nursery areas. The latter is then ascribable to the cumulative effect of relatively little enrichment of bioenergetic elements from salmon carcasses onto the insugation of commercial fishing opera-tions in comparison with the prefishing era when the entire virgin run escaped to the spawning grounds.—Copyright 1972, Biological Abstracts, Inc. since the instigation of commercial fishing opera-W72-12319

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THERMODYNAMICS OF SALINE WATER, Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div. of Applied Chemistry. For primary bibliographic entry see Field 03C. W72-11758

BETTER TOOLS FOR WATER RESOURCES, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering. For primary bibliographic entry see Field 03B.

BIBLIOGRAPHY OF SALINE WATER CON-VERSION LITERATURE, Rocketdyne, Canoga Park, Calif. J. J. Schamus.

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J. J. Schamus.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$1.75. Office of Saline Water Research and Development Progress Report no 146, Sept. 1965. 373 p, 4 fig. OSW 14-01-0001-356.

Descriptors: *Bibliographies, *Desalination, Documentation Desalination processes.

A bibliography by subject matter, an alphabetical author index keyed to the subject bibliography, and an alphabetical, permuted cross index to the subject bibliography are included. Over 8000 reference titles were screened. Of these, over 1500 were eliminated as duplicates, and approximately 450 did not contain sufficient information for inclusion. The bibliography was built from about 6,120 individual references, and contains an estimated 12,000 entries (each entry appears under an average of slightly less than 2 subject headings). (OSW)

RESEARCH ON ION TRANSPORT ACROSS MICROBIAL MEMBRANES, TRW Space Technology Labs., Redondo Beach,

Calif. B. H. Goldner.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$0.30. Office of Saline Water Research and Development Progress Report no 160, Dec. 1965. 37 p, 15 fig, 4 tab. OSW 14-01-0001-416.

Descriptors: *Membranes, *Ion transports, *Biological membranes, *Permeability, *Desalination processes, Osmosis. Identifiers: *Microbial membranes, *Salt transport, Cytoplasmic membranes, Light scattering, Glycolytic inhibitors.

The mechanisms involved in the transport of inorganic ions across cytoplasmic membranes were investigated. A systematic and comparative investigation of certain salt transport characteristics was begun to determine the relationship between the divergent salt tolerance properties of two bacthe divergent and obtained properties in the case the case teria and membrane structure and function. The permeability and transport rates of the chloride salts of sodium, lithium, potassium, magnesium, strontium and calcium were examined by suspending resting cells in hypertonic salt solutions. The ing resting cetts in hyperfonc sait solutions. The resulting plasmolysis was measured by an increase in light scattered by the cell suspension. The immediate increase in light scattering was followed by a gradual decline in light scattering, attributable to salt accompanied by water re-entering the cell deplasmolysis). The phase of growth at which the cells were harvested influenced both the magnitude of the absceledations and the rates of the absceledations. cells were harvested influenced both the mag-nitude of the plasmolytic response and the rate at which cations permeated the cells. The youngest cells produced the largest response and were the most resistant to deplasmolysis. The transport of salt is an active process and appears to be depen-dent upon the energy derived from the dissimila-tion of the endogenous reserve material, glycogen. The glycolytic inhibitors, iodoacetate and mercu-ric ion completely retarded or inhibited the retard The glycolytic inhibitors, iodoacetate and mercuric ion, completely retarded or inhibited the rate of salt transport. The respiratory inhibitors, 2,4 dinitrophenol, arsenite and cyanide, accelerated the rate of salt uptake. The rate of transport was suppressed when the cells respired formate. Hydrogen ion concentration modified the response to the salts-the higher the pH, the greater the plasmolytic response, and the faster the rate of transport. Salts were transported more slowly when oxygen was absent than under aerobic conditions, possibly reflecting the influence of the redox potential of the suspending medium. Shaking the cell suspension vigorously in air resulted in enhanced rates of salt transport, however, these results can not yet be explained. (OSW)

DESIGN STUDY OF LARGE MULTIPLE PHASE EJECTOR DRIVEN DESALINATION PLANTS, Kaye Instruments, Inc., Cambridge, Mass. G. F. Harper, and J. H. Leigh.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$1.75. Office of Saline Water Research and Development Progress Report no 748, Oct. 1971. 64 p, 10 fig, 9 ref. OSW 14-01-0001-2256.

Descriptors: Economics, *Cost analysis, *Desalination plants, Thermodynamics, Vapor compression distillation, Computer programs, *Optimumization, Flowsheets, *Multistage flash

distillation.

Identifiers: *Multiple phase ejectors, *Systems descriptions, Verticle tube evaporation.

descriptions, Verticle tube evaporation.

Large sea water distillation plants driven by Multiple Phase Ejectors (MPE) were evaluated and the characteristics and costs of the most promising configurations determined. The optimum plant combined a multi-stage flash (MSF) feed heater with vertical tube evaporator (VTE) effects, was selected for mathematical modeling. The parametric calculations were performed by a computer program. Oak Ridge National Laboratory added a cost analysis to the computer program to enable determination of an optimum cost 8.0 MGD-MPE/VTE/MSF distillation plant. The plant consists of 16 VTE effects with 42 MSF stages. A single ejector drives 4 of the VTE effects. Energy for the system is furnished by a fossil-fuel-fired boiler. Electrical power is furnished by a steam turbine-driven generator integral with the plant. Water production from the MPE-driven VTE effects is 42.7 percent of total plant production; 43.9 percent of the total is produced in the remaining VTE effects, and 13.4 percent in the MSF stages. The plant performance ratio is 15.36 pounds of product water per 1000 BTU. Capital cost of the plant is estimated to be \$1.02 per daily gallon of capacity and product cost to be 44.68 cent per 1000 gallons under the cost estimates and ground rules of the study. (OSW) of the study. (OSW) W72-12046

APPARATUS AND PROCESS FOR OBTAINING POTABLE WATER FROM SALINE SOLUTIONS, R. A. Nye, and D. M. Nye. U.S. Patent No. 3,549,522, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1556, December 22, 1970.

Descriptors: *Patents, *Desalination, *Heat exchange, *Refrigeration, *Gravity, Thermal diffusion, Brine, Sea water, Potable water, Reverse osmosis.

This invention provides a concept to overcome problems which develop in other desalination activities. This process utilizes a three-stage semi-reversible, heat exchange and refrigeration procedure which takes advantage of operating characteristics which require low operating energy and low production costs. This is done by subjecting the entering solution to super cooling temperatures to develop strong thermal diffusion forces in the solution, and then conducting the lighter components of the water upward through a reverse osmosis, semi-permeable section containing hydrophylic and brine-repelling substances. The procedure is aided by catalytic forces, gravity, and thermal diffusion acting on the brine as it separates from the solution. (Sinha-OEIS)

REMOVAL OF SULFATES FROM BRINES, Department of the Interior, Washington, D.C. W. Pechenick, and G. P. Gelblum. U.S. Patent No. 3,547,579, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1079, December 15, 1970.

Descriptors: *Patents, *Brines, *Desalination, *Sulfates, Metals, *Ion exchange, *Resins.

Identifiers: Barium, Barium hydroxide, Barium hydrosulfide.

The brine is contacted with an ion exchange resin in the form of barium. Sulfates are thereby precipitated as barium sulfate and the resin is converted into a metal form. Barium sulfate is reduced to barium sulfide which is leached with water to form an equimolar solution of barium hydroxide and barium hydrosulfide. Sodium hydroxide and sodium hydrosulfide solutions resulting from resin regeneration are then used to produce valuable byproducts. The process may be used to remove sulfates from brines prior to procedures in saline water conversion. (Sinha-OEIS)

TUBULAR REVERSE OSMOSIS EQUIPMENT, Aqua-Chem Inc., Waukesha, Wis. G. B. Clark. U. S. Patent No. 3,542,204, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1315, November 24, 1970.

Descriptors: "Patents, "Desalination, "Reverse osmosis, "Membranes, Sea water, Potable water, Equipment, Semipermeable membranes. Identifiers: "Tubular membranes.

The equipment designed to remove dissolved solids from liquids by reverse osmosis (as in desalination) consists of a membrane of generally uniform cross section. It includes a tubular film formed of a semipermeable membrane material and is supported by a rigid tube. An end cap has at least one channel in fluid communication with the interior of the tubular film. The sealing device includes a gasket having a portion of greater radial cludes a gasket having a portion of greater radial extent than the membrane structure. (Sinha-OEIS) W72-12144

SPIRAL REVERSE OSMOSIS DEVICE, Desalination Systems, Inc., Escondido, Calif. R. D. Hancock, and D. T. Bray. U. S. Patent No. 3,542,203, 4 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1315, November 24, 1970.

Descriptors: *Patents, Sea water, *Desalination, Potable water, Water purification, *Reverse osmosis, *Membranes.

A housing is provided for a reverse osmosis spiral membrane module. The housing is in the form of a tubular pressure container which is easily separable for removal and replacement of the module. The reverse osmosis membrane module includes a membrane sheet assemblage wound onto a sealed tubular casing and covering apertures in the longitudinal surface for the flow of product water through the membrane and apertures into the casing and through its projected outlet tube. (Sinha-OEIS) W72-12145

REVERSE OSMOSIS WATER PURIFICATION

UNIT, D. T. Bray, and R. M. Brown. U. S. Patent No. 3,542,199, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1314, November 24, 1970.

Descriptors: "Patents, "Water purification, "Reverse osmosis, Brine, Brackish water, Water quality, Water quality control, "Waste water treatment, "Activated carbon.

This invention comprises a casing holding a semipermeable membrane cartridge having a central collectors or the purified water. Water passes through a bed of activated carbon or other purifying agent before reaching the outlet. Clarification by means of a filter, and a treatment chemical mane applied to the incoming feed water. Since the product water relief connection is between two

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

restricted conduits, pressure will be maintained in the product water system at a level depending on the resistance in each of the restricted conduits. W72-12146

DISTILLATION CONDENSATION APPARATUS WITH VAPOR COMPRESSION AND SEMI-PERMEABLE MEMBRANE,

U. S. Patent No. 3,540,986, 2 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 979, November 17, 1970.

Descriptors: *Patents, *Distillation, Semipermeable membranes, Separation techniques, *Vapor compression distillation, *Condensation, Water treatment, Sea water, Potable water, Evaporation.

This device uses a semipermeable conduit as an evaporative surface. Heated distilland liquid is rapidly circulated through the membrane conduit in a path that is provided by the membrane's internal support and the membrane. The support is hollow in order to permit the passage of the com-pressed vapor. The semipermeable membrane conduit permits a rapid circulation of the distilland liquid which in turn causes a higher rate of evaporation through the membrane wall. The porosity of the membrane prevents the passage of chemical contamination and suspended solids. The rapid circulation of the distilland liquid prevents the accumulation of deposits in the membrane pores. (Sinha-OEIS) W72-12148

EVAPORATION-CONDENSATION RECOVERY OF FRESH WATER USING GAS-TRAVERS-ABLE POROUS BED,

G. Tufo. U. S. Patent No. 3,539,454, 9 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 583, November 10, 1970

Descriptors: *Patents, Sea water, *Desalination, *Distillation, Evaporation, Condensation, Sewage treatment, Liquid wastes, Water treatment, *Waste water treatment, Separation techniques, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Water purification.

The process begins with adsorbing a solution, or a mixture of liquid and solid or solids to be separated, on the surface of a solid substrate material. A heated, inert carrier gas is then directed across the surface to vaporize the liquid where the gas first contacts it. The geometry and physical size of the substrate material are such that, as the carrier gas continues its traversal of the solution-carrying surface, it loses heat until its temperature is sufficiently low that a condensation of the previously vaporized liquid component occurs. The carrier gas and entrained droplets are directed to a separation zone where known techniques and apparatus are used for recovery of the droplets from the carrier gas. (Sinha-OEIS)

EVAPORATION OF LIQUID NATURAL GAS WITH AN INTERMEDIATE CYCLE FOR CON-DENSING DESALINIZED WATER VAPOR, Linde A. G., Munich (West Germany). (assignee).

H. Linde, and G. Linde.

U. S. Patent No. 3,535,210, 3 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 879, No 3, p 869, October 20, 1970.

Descriptors: *Patents, *Desalination, *Heat exchangers, Evaporation, *Condensation, Sea water, Potable water, *Flash distillation, Natural gas, Separation techniques, Propane. Identifiers: *Liquefied natural gas, *Ethane.

After flash evaporation of saline water at about 12 degrees C under vacuum, the water vapor is con-densed in indirect heat exchange with liquefied propane or ethane. The vaporized propane or ane is used in a closed cycle to vaporize the natural gas, simultaneously liquefying the propane or ethane. Ice formation is avoided by mixing cycle liquid with cycle vapor under conditions which yield a condenser coolant of 1 - 6 degrees C. (Sinha-OEIS) W72-12157

REVERSE OSMOSIS CONCENTRATION OF DILUTE PULP AND PAPER EFFLUENTS, Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems; and Pulp Manufactures Research League, Appleton,

For primary bibliographic entry see Field 05D. W72-12189

RECYCLING OF SALINE WASTES, Montana State Univ., Bozeman. For primary bibliographic entry see Field 05D.

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES', Centre d'Etude de l'Energia Nucleaire, Mol (Belgium). For primary bibliographic entry see Field 05D.

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES', Rohm and Haas Co., Philadelphia, Pa. For primary bibliographic entry see Field 05D. W72-12287

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES', Bostock, Hill and Rigby, Birmingham (England). For primary bibliographic entry see Field 05D. W72-12288

3B. Water Yield Improvement

PHOTOSYNTHETIC BRIGALOW TO IRRADIANCE, TEMPERA-TURE AND WATER POTENTIAL. British Columbia Forestry Service, Victoria. Research Div. For primary bibliographic entry see Field 02I.

BETTER TOOLS FOR WATER RESOURCES, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering. J. E. McKee.

Journal of the American Water Works Associa-

tion, Vol 58, No 2, p 131-137, February 1966. 10

Descriptors: *Water resources, *Nuclear energy, *Nuclear explosions, *Water reuse, Evaporation control, Desalination processes, Groundwater basins, Groundwater recharge, Legal aspects, Water demands, Weather modification, Aerial photography, California, Underground, Excava-

Identifiers: *Evaporation suppression, Legal analysis, Western States Water Council, California

The major problems in water resources relate to the time and space distribution of fresh water. New tools, now in use or in need of development, are needed to make water available at the right place and the proper time. These include nuclear

energy for power, excavation, subsurface storage and desalting. Extended use of computer is needed in planning, execution and operation. Communication systems must be vastly improved. Operations analysis and personnel to use this tool in the water industry will become common. Other tools include wastewater reclamation, aerial photography, evaporation suppression, desalting groundwater development, improved materials, weather modification, and improved legal analysis. (Flack-AWWARF) W72-11891

CRITERIA FOR ANALYSIS OF INTERRE-GIONAL TRANSFERS OF WATER, Washington State Water Research Center, Pull-

For primary bibliographic entry see Field 06B.

EFFECTS OF CONSERVATION TECHNIQUES

ON YIELD, U. Stephens. Journal of the American Water Works Association, Vol 56, No 8, p 991-1000, August 1964. 4 tab,

Descriptors: *Water conservation, *Soil conservation, *Impoundments, *Stock water, *Farm ponds, *Water yield, Runoff, Sedimentation rates, Consumptive use, *Texas.

Identifiers: *Depletion, Stock ponds, Suspended sediment, Elm Fork, Lake Fork Reservoir.

The effects of soil conservation practices on water yield have been extensively investigated but many questions remain. Based on investigations in Texas, the effects of upstream retention on yield are: (1) reduction in runoff and yield, (2) yield reduction is insignificant in years of above average rainfall but substantial in dry years, (3) reservoirs should be designed for critical, not average, conditions, (4) all affected parties should be involved in watershed improvement planning, (5) the minimum number of ponds should be built and (6) research is needed on seepage from upstream reservoirs. (Flack-AWWARF) W72-11909

SURVEY OF METHODS FOR EVAPORATION CONTROL.

American Water Works Association, New York.

Committee on Evaporation Control.

Journal of the American Water Works Associa-tion, Vol 55, No 2, p 157-168, February 1963. 54

Descriptors: *Evaporation control, *Monomolecular films, *Reservoir evaporation, *Water conservation, Water yield improvement, Evaporation pans, Waves (Water), Reservoir sites, Reservoir silting, Alcohols, Hexadeconal, Underground storage, Octadecanol, Windbreaks, Phreatophytes, Arid climates, Seepage. Identifiers: Australia, Western United States.

Reservoir evaporation in the 17 western states has been estimated at 15,600,000 acre-ft per year. Reducing evaporation is a key to supplying new sources of cheap water - 5 to 15 cents per 1000 gal. Methods of control include silting of the reservoir to reduce surface area, avoiding shallows by fills or dikes, reduction of phreatophytes, building windbreaks, covering including underground storage, reduction of seepage and use of monolayers. Hexadecanol and octadecanol are used as evaporation suppressants. Australian field trials report evaporation control at 2 to 3 cents per 1000 gallons saved. (Flack-AWWARF)

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Use of Water of Impaired Quality—Group 3C

REDUCING POND EVAPORATION WITH PER-LITE ORE

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. K. R. Cooley, and C. B. Cluff.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8953, p 255-266, June 1972. 5 fig, 6 tab,

Descriptors: *Evaporation control, *Reservoir evaporation, *Perlite, Water conservation, Water yield improvement, Dissolved oxygen, Water tem-

Floating solid and granular materials appear to provide a practical means of reducing evaporation losses from open water surfaces. The increased ef-ficiency of these materials over monomolecular ficiency of these materials over monomolecular films is due to their ability to reflect a greater portion of the incoming radiation. Perlite ore reduced pond evaporation 19%, over a 9-month period, for \$0.36/1,000 liter, which compares with previous studies conducted on small tanks. Temperatures were reduced 1 deg C to 3 deg C at the surface and 3 deg to 5 deg at the 91-cm depth. Wind caused the period of the surface and the s perlite to compact and windrow; however, the per-lite redistributed when the wind receded. A complete perlite cover did not affect fish growth complete pertue cover du not affect insi growth significantly during the cool months, but was detri-mental during the hot summer season. Oxygen content of the covered pond was also reduced dur-ing the hot season. (Knapp-USGS) W72-11990

PLANT MOISTURE STRESS PATTERNS IN EUROTIA LANATA AND ATRIPLEX CONFER-

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Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center. For primary bibliographic entry see Field 02I. W72-12344

ROOTING CUTTINGS OF SALTBUSH (ATRIPLEX HALIMUS L.),
Volcani Inst. of Agricultural Research, Bet-Dagan

(Israel). Dept. of Agronomy.

S. J. Ellern. Journal of Range Management, Vol 25, No 2, p 154-155, March 1972. 1 fig, 5 ref.

Descriptors: *Shrubs, *Xerophytes, *Range management, *Cutting management, *Humidity, Forages, Greenhouses, Vegetation establishment, Plant root systems.
Identifiers: *Saltbush, *Plant cuttings, *Vegeta-

tive propagation.

Saltbushes (Atriplex sp.) grow well and supply nutritious browse to livestock in arid and semiarid regions and on saline soils. Salt (NaCl) content and oxalate levels affect livestock intake. There is conoxalate levels affect livestock intake. There is considerable seasonal and between-plant variability in these plants, so efforts have been made to propagate selected planting material quickly and cheaply. Tips of young branches of saltbush 8-10 cm long were detached and planted under high humidity conditions for 2 months in cheap chambers of transparent plastic sheeting. The cuttings were of 2 kinds: green and soft (1-3 mm diameter) and young but woody (2-5 mm diameter). In the first experiment the cuttings were taken from the peak of the spring flush, while in the second experiment, branches bearing seed were avoided. The ment, branches bearing seed were avoided. The kind of cutting used was unimportant and spring seemed preferable to autumn for taking cuttings. Over 76% of the cuttings rooted and remained green. (Casey-Arizona) W72-12348

SPONTANEOUS VEGETATION OF THE MUR-RAY SPRINGS AREA, SAN PEDRO VALLEY,

ARIZONA, California Univ., Los Angeles.

S. L. Woodward.

Journal of the Arizona Academy of Science, Vol 7, No 1, p 12-16, February 1972. 3 fig, 13 ref.

Descriptors: *Ecological distribution, *Biological communities, *Xerophytes, *Drainage basins, *Grasses, Plant groupings, Arroyos, Surveys, *Arizona, Deserts, Shrubs, Environmental effects, Mode of Action. Identifiers: *Pedro Valley (Ariz).

Dense thornscrub, an enclave of the Chihuahuan Desert flanks the calcareous lower bajadas of the upper San Pedro River in Cochise County, upper San Pedro River in Cochise County, Arizona. Fossil animal bones and human artifacts have been unearthed there and a postglacial pollen recond has been extracted as part of the effort to reconstruct the landscape over which ancient peo-ples roamed in search of large game. To make sense of the pollen record with respect to vegeta-tion and climatic changes, the modern pollen rain must be analyzed in terms of present vegetation. It is therefore important to identify existing vegetais therefore important to identify existing vegeta-tion and determine whether it is climatically. tion and determine whether it is climatically, edaphically or culturally controlled. The only grass-covered areas in both the Chihuahuan Desert proper and the Arizona outlier are on flood plains and shallow depressions on the interfluves. The perennial grama grasses of the desert grasslands are absent. A vegetational analysis of the dominant species reveals a striking similarity to Chihuahuan Desert vegetation. This, together with the grass communities, suggest that the thornscrub is edaphically controlled and does not represent a recent invasion of grassland similar to what has recent invasion of grassland similar to what has been found at higher elevations in Cochise Coun-ty. These conclusions are supported by Land Of-fice survey notes going back to 1879. (Casey-Arizona) W72-12362

3C. Use of Water of Impaired Quality

SALINITY AND WATER USE.

Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div of John Wiley and Sons, Inc, New York, T. Talsma, and J. R. Philip, editors, 1971.

Descriptors: *Salinity, *Water utilization, *Research and development, *Water resources development, Irrigation water, Municipal water, Desalination, Groundwater, Land reclamation, Land management, Water management (Applied), Geochemistry, Water quality, Australia.

This second Australian symposium on hydrology aims at providing an up-to-date review of the scientific and, to some extent, the social problems which arise from natural and man-made salimity. which arise from natural and man-made salinity. The papers vary from detailed consideration of the effects of salinity on plant and animal cells to administrative and legal aspects of saline water, use and management. (See W72-11756 thru W72-11772) (Knapp-USGS) W72-11755

THE GEOCHEMISTRY OF UNDERGROUND

Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of

Organization, Chatswood (Australia). Div. of Mineralogy.
D. J. Swaine, and J. L. Schneider.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, Sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc., New York, p 3-23, 1971. 7 fig, 2 tab, 45

Descriptors: *Water chemistry, *Connate water, *Groundwater, *Diagenesis, Brines, Saline water, Saline water systems,

Chemical reactions, Water quality, Ion exchange, Water circulation, Groundwater movement, Salinity, Water utilization.

The geochemical aspects of underground waters, starting with the origin of the waters and effects occurring during diagenesis and compaction are discussed. Other important factors, dealt with in discussed. Other important factors, dealt with in detail, are the composition of water and the nature of the aquifer, the modification of composition by membrane filtration effects, evaporation, sulphate reduction, and ion exchange. The means of studying changes in chemical composition are also outlined, Examples are given of investigations in Chad, Cap Vert Peninsula, North Cameroon and the Gironde Estuary. Hydrochemical maps are most helpful in the assessment of water use and in most helpful in the assessment of water use and in the monitoring of pollution. The processes that connate waters have undergone are summarized as follows: diagenetic changes associated with the action of bacteria and the decomposition of organic matter during the early stages of sedimentation; reactions between constituent minerals and interstitial water at various stages of diagenesis and metamorphism; compaction during sedimentation; membrane filtration; and other effects, such as contact with evaporites. In sedimentary rocks, the freshest waters are located in siliceous sands and sandstones, essentially formed by quartz. The most mineralized waters are those in contact with deposits of evaporites. The chemical composition of groundwater often changes during circulation due to concentration, dilution, ion exchange and reduction phenomena. (See also W72-11755) (K-napp-USGS)
W72-11756

SALINITY AND THE HYDROLOGIC CYCLE, Flinders Univ., Beaford Park (Australia). School

of Physical Sciences. J. W. Holmes.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971. Wiley-Interscience, Div. John Wiley and Sons, Inc., New York, p 25-40, 1971. 6 fig, 8 tab,

Descriptors: *Saline water systems, *Hydrologic cycle, *Path of pollutants, *Water chemistry, Saline water, Soil chemistry, Rainfall, Runoff, Water balance, Hydrologic budget, Ion transport, Aqueous solutions, Water quality, Salts, Salinity, Water utilization, Groundwater, Surface waters. Identifiers: Salt cycle.

The hydrologic cycle is a concept to allow orderly description of the ways in which precipitation on the land surface is partitioned between evaporation, run-off, and other lesser consumption. The cycle is usually in a natural steady state, or at least, natural perturbations have a time scale of the order of thousands of years. The salt cycle also usually exists in a steady state. Irrigation and other less drastic changes in land utilization, which af-fect the components of the water budget, perturb the hydrologic and salt cycle with a time scale that may be of the order of tens of years. Deterioration of water quality in rivers and secondary salinization of soils are two major consequences of a disruption of the natural regime initiated by civilia-tion. (See also W72-11755) (Knapp-USGS) W72-11757

THERMODYNAMICS OF SALINE WATER,

Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div.

of Applied Chemistry.

J. E. Lane, and W. W. Mansfield.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australia Academy of Science, Nov 2-4, 1971. Wiley-Interscience, Div of John Wiley and Sons, Inc., New York, p 43-60, 1971. 2 fig, 18 ref.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C—Use of Water of Impaired Quality

Descriptors: *Saline water, *Water chemistry, *Thermodynamics, Thermodynamic behavior, Chemical potential, Saline water systems, Geochemistry, Ion exchange, Equilibrium, Free energy, Enthalpy, Entropy, Physicochemical properties, Temperature, Desalination, Distillation, Reverse osmosis, Freezing, Adsorption, Salinity,

The thermodynamic state of a saline solution is completely specified by the temperature, pressure and chemical potential of the components that are present. The chemical potential can be defined rigorously in mathematical terms but in this form often provides difficulty in conception. In order to overcome this difficulty for solutions, it is useful to relate the chemical potential to some ideal reference solution; the deviation between real and ideal solution is formalized in terms of an activity coefficient, and sometimes in the case of a solvent by an osmotic coefficient. The activity coefficients can be obtained from experiment, and are well tabulated. Changes in the chemical potentials of the components of a saline solution due to variations in temperature, pressure, environment or the external field can be obtained by the use of very simple expressions; any additional informa-tion required is measurable. These relationships are applied to desalination by distillation, by freezing and by reverse osmosis, to Donnan membrane equilibria, to the resting potential of a nerve fibre, and to surface effects in a porous solid. (See also W72-11755) (Knapp-USGS)

A SURVEY OF THE PRINCIPLES OF METAL-LIC CORROSION AND ITS CONTROL IN SALINE WATERS,

Commonwealth Scientific and Industrial Research Organization, Garden City (Australia). Div. of Mineral Chemistry. W. T. Denholm, and E. C. Potter. In: Salinity and Water Use, Proceedings of a Na-

tional Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 61-78, 1971. 4 fig, 19 ref.

Descriptors: *Corrosion, *Saline water, *Water chemistry, *Inhibition, Corrosion control, Well casings, Chemical reactions, Electrolysis, Well screens, Oxidation-reduction potential, Hydrogen ion concentration, Salinity, Water utilization.

An outline of the theory of corrosion processes is presented, using pH-potential diagrams to summarize theoretical and experimental data relating to corrosion. The pitting corrosion of iron in chloride-containing waters is treated in some detail. The complicating effects of many factors which influence corrosion behavior in practical cases are discussed and the more common methods of corrosion control explained. (See also W72-11755) (Knapp-USGS) W72-11759

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES,

Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science.

J. P. Onirk.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 79-91, 1971. 2 fig, 1 tab, 32

Descriptors: *Saline soils, *Expansive soils, *Clays, Water chemistry, Permeability, Irrigation, Clay materials, Water pollution effects, Ion exchange, Adsorption, Electrolytes, Osmosis, Leaching, Salinity, Water utilization.

An outline of the forces involved in clay particle An outline of the forces involved in clay particular interaction (swelling and dispersion) is given as a background for the interpretation of the physical behavior of sodic soils, especially in relation to electrolyte levels. The electrolyte concentration below which appreciable decreases in soil permeability, and the solid permeability and the solid permeability and the solid permeability and the solid permeability and the solid permeability. bility are encountered has been termed the treshold concentration and this concentration increases with the degree of sodium saturation of the soil colloids. The application of the treshold con-centration concept to the management and recla-mation of sodic soil is discussed. (See also W72-11755) (Knapp-USGS)

HYDROLOGY OF SWELLING SOILS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of En-vironmental Mechanics.

J. R. Philip. In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 95-107, 1971. 7 fig, 23 ref.

Descriptors: *Expansive soils. *Soil water move-Department, Expansive clays, Soil moisture, Water chemistry, Saline soils, Saline water, Unsaturated flow, Saturated flow, Moisture content, Hydraulic conductivity, Salinity, Water utilization.

Hydrologic difficulties often arise in drainage and reclamation of swelling clays in flat landscapes. Recent progress in the theory of water equilibrium and movement in swelling soils is reviewed. Neglect of the fact of swelling may lead to serious errors of interpretation. In swelling soils, the potential includes an additional component, the overburden potential. Classical concepts of groundwater hydrology, tacitly based on the behavior of nonswelling soils, fail in many important ways for swelling ones. Aspects which differ profoundly from those of nonswelling soils include the following: equilibrium moisture profiles, the distribution of hydraulic conductivity relative to the water table, the effect of topography on moisture distribution, the variation of specific yield with water table elevation and stratum yield with water table elevation and stratum thickness, and the character of steady and un-steady vertical flows. (See also W72-11755) (K-napp-USGS) W72-11761

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS,

Commonwealth Scientific and Industrial Research Organization, Wembley (Australia), Div. of Soils. A. J. Peck.

A. J. Peck.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 109-123, 1971. 1 fig, 68 ref.

Descriptors: *Ion transport, *Soil water move-ment, *Dispersion, *Saline water, Diffusion, Per-colation, Ion exchange, Adsorption, Convection, Salinity, Water utilization, Saline water systems, Mass transfer, Osmosis, Saturated flow, Unsatu-

Transport of soluble salts in soils results from movement of the soil solution as a whole and molecular diffusion within the soil solution. At very slow rates of solution flow, molecular diffusion is the dominant transport mechanism but diffusion in solution is a very slow process. The presence of the solid and gaseous phases in soils, and exchange or adsorption of solutes result in even lower diffusion coefficients in soils than in bulk solution. In the vicinity of the plant roots, molecular diffusion may be the dominant transport process at somewhat greater rates of convection due to the possible association of a relatively high concentration gradient and low nutrient concentration. In general, molecular diffusion interacts with the convection of solutions and each process contributes to the dispersion of solutes. Thus inert solutes are mostly transported at the average velocity of the solution, but there is a superimposed dispersion of solutes about the mean posi-tion at any instant. Mathematically this dispersion may be treated as a diffusion-like process. Solutes which experience adsorption or exchange on soil surfaces travel at less than the average pore velocity. (See also W72-11755) (Knapp-USGS) W72-11762

GROUNDWATER PROBLEMS OF THE INTERACTION OF SALINE AND FRESH WATER, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.

vironmental mechanics.
R. A. Wooding.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 125-139, 1971. 55 ref.

Descriptors: *Groundwater movement. *Stratified flow, "Mixing, "Saline water-freshwater inter-faces, Salinity, Water utilization, Saline water systems, Saturated flow, Aquifer characteristics, Convection, Diffusion, Dispersion.

Hydrodynamical aspects of flow of saline groundwater in a nonreacting medium are reviewed. Top-ics covered include macroscopic scales and dimenless parameters, conditions for stable flow, problems of stably-stratified flows, and stable and unstable mixing layers. For groundwater flow under saturated conditions, the driving head is usually gravitational, whether due to differences in phreatic-surface level or to density differences arising from nonuniform distribution of salinity. Systems in which the density increases in the up-ward direction tend to be gravitationally unstable. A reduction in potential energy can be achieved by overturning the fluid. A further mechanism of instability arises when a nonhomogeneous fluid is driven in a direction of increasing viscosity. In groundwater flow, the appearance of instability is associated with either positive upward density gradients or an increase of viscosity in the direction of flow, or a combination of both. (See also W72-11755) (Knapp-USGS) W72-11763

THE TRANSPORT OF SALT IN RIVERS AND

ESTUARIES, New South Wales Univ., Kensington (Australia). Water Research Lab.

I. R. Wood.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 141-157, 1971. 8 fig, 30 ref.

Descriptors: *Saline water intrusion, *Stratified flow, *Mixing, *Dispersion, *Estuaries, Saline water-freshwater interfaces, Ion transport, Mass transfer, Salinity, Water utilization, Diffusion,

In order to follow the transport of salt in rivers, estuaries and lakes, it is not only necessary to be able to analyze the flows in these systems but also to understand the diffusion processes in these flows. Progress in understanding these processes and in analysing cases of engineering importance is reviewed. In well mixed flows, the variations in salt concentration are so small that the effect on the flow properties of the system may be neglected. In this case tha analysis is based on Taylor's classic papers on dispersion. In stratified flows the salt concentration gradients acted on by the gravitational field cause internal flows which

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Use of Water of Impaired Quality—Group 3C

dominate the transport of salt. In this case the flow may be analyzed as two distinct layers. For simple cases of partially mixed flows, the analysis used is the same as that for a well mixed flow but with a greatly increased dispersion coefficient. (See also W72-11755) (Knapp-USGS)

SALINITY AND THE WHOLE ANIMAL, Adelaide Univ. (Australia). Waite Agricultural Research Inst.

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W. V. MacFarlane linity and Water Use, Proceedings of a Nain: sainnty and water Use, Proceedings of a Na-tional Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 161-178, 1971. 2 fig, 4 tab, 62 ref.

Descriptors: *Salinity, *Physiological ecology, *Pathology, *Osmosis, *Biochemistry, Biological properties, Water pollution effects, Animal physiology, Metabolism, Environmental effects, Osmotic pressure, Translocation, Water balance. Identifiers: *Salinity effects (Animals).

Land mammals have mechanisms to maintain in-tercellular and intracellular electrolyte concentra-tions. Sodium conservation is highly developed. In the ocean and in arid hot areas the salinity of water reaches four or more times that of the body fluids. reaches four or more times that of the body Huids. The toxicity of Na salts is complex. They may reduce plasma K levels, which leads to circulatory inadequacy. High plasma and cellular Na also reduces appetite, causes drowsiness, incoordination, spasticity, and finally autogenous firing of neurones. Potassium salts come mainly from plants and large quantities of K can be readily excreted. Potassium retention causes spontaneous firing of nerves and muscles, heart irregularities, and fibrillation. Calcium salts in hard saline waters are not readily absorbed but rather cause water loss through diarrhea. When Ca is absorbed it facilitates conduction in nerve and muscle, in-creases the force of skeletal and heart muscle concreases the force of skeletal and near muscle con-traction, and facilitates nerve-muscle transmis-sion. Stones of Ca oxalate, carbonate or phosphate may form in the kidney or renal tract in dry re-gions. The degree to which growth, fertility and ef-ficiency are reduced by saline waters is deter-mined by species or breed of animal; and the effects are modulated by food, air temperature, age and lactation. (See also W72-11755) (Knapp-W72-11765

SALINITY AND ANIMAL CELLS, New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology.

P. W. Gage.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 179-191, 1971. 4 fig, 10 ref.

Descriptors: *Salinity, *Physiological ecology, *Pathology, *Osmosis, *Biochemistry, Biological properties, Animal physiology, Metabolism, En-vironmental effects, Osmotic pressure, Translocation, Water balance.
Identifiers: *Salinity effects (Animals).

Biological cells exist in a saline environment which differs in ionic composition from the intracellular solution. Potassium is more concentrated inside, whereas sodium is more concentrated outside cells. In the resting state, cell membranes are much more permeable to potassium than to sodi-um ions and this results in an electrical potential across the membranes. The transmission of electrical signals, communication between cells, and the production of electrical signals all depend on an inflow of sodium ions into cells as a result of an increase in the sodium permeability of the cell

membrane. The basic unit of electrical signalling is the action potential which is initiated by depolarization and consists of a brief reversal of membrane potential. To recharge after current has been drawn, ionic pumps driven by metabolic energy regulate salinity by a delicate balance between an organism's intake, storage, and excretion of salts and water. Calcium is essential for the maintenance of the normal joinic permeabilities of tion of salts and water. Calcium is essential for the maintenance of the normal ionic permeabilities of cell membranes, for the secretion of neurotransmitters and hormones, for contraction in muscle, for some enzyme reactions, for the cohesion of cells, and for bone and teeth formation. Maintained concentration gradients of sodium and potassium ions are necessary for normal membrane potentials and action potentials. (See also W72-11755) (Kanpp-USGS) W72-11766

SALINITY AND THE WHOLE PLANT, Adelaide Dept. of Agriculture (Australia).

J. B. Robinson.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 193-206, 1971. 1 fig., 3 tab,

Descriptors: *Plant physiology, *Salinity, *Osmotic pressure, Biochemistry, Environmental effects, Metabolism, Osmosis, Physiological ecology, Translocation, Water balance. *Salinity,

Present knowledge concerning the behavior of ionic species within the plant is discussed, with particular reference to the leaf, and a possible experimental approach is developed. With techniques presently available the dynamic state of the extracellular part of the ionic content of plants with respect to any particular ion can be determined. Using tissue slices, and duplicating the native state of the leaf cell, information on the ionic and water relations of the leaf cell could be ionic and water relations of the leaf cell could be obtained. Extrapolation of such data to the native state may enable distinction to be drawn between the 'osmotic' and 'specific ion toxicity' theories of salt damage. (See also W72-11755) (Knapp-USGS) W72-11767

SALINITY AND PLANT CELLS, Sydney Univ. (Australia). School of Biological

Sciences.
L. C. Campbell, and M. G. Pitman.
Ln: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 207-224, 1971. 6 fig. 3 tab, 45 ref.

Descriptors: "Plant physiology, "Salinity, "Osmotic pressure, Biochemistry, Environmental effects, Metabolism, Osmosis, Physiological ecology, Translocation, Water balance.

Regulation of ionic content by plant cells and possible ways salinity may disrupt cell function and development are discussed. Selective uptake of K relative to Na has some importance but in general, plants seem less dependent on ionic balance than do animal cells. The effect of salinity and osmotic pressure on the activity of mitochondria and chloroplasts is discussed in relation to electron transport processes. It is suggested that some of the effects of salinity on cell activity can be explained in terms of membrane structure. (See also W72-11755) (Knapp-USGS)

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Gutteridge, Haskins and Davey, Melbourne (Austrice)

tralia). B. J. Callinan, and R. G. Webster.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 227-242, 1971. 4 fig, 4 tab,

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

Salinity problems in Australia result from high salinities in streams and in shallow water tables. The major areas affected are the River Murray Valley and the southwestern parts of Western Australia and Victoria. The evaluation of the consequences of salinity problems must commence with knowledge of the economic and social bases upon which the region functions. Salinity-control measures are essentially long-term and their economic evaluation is best made with discount rates which are reduced for long-term costs and benefits. The social consequences must be given due weight in the light of conditions in cities. The effects of high salinities can be lessened in areas already affected, and avoided in areas about to be developed, by investigations, planning and condeveloped, by investigations, planning and con-trol. Planning legislation can be used to exercise essential controls. (See also W72-11755) (Knapp-

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Melbourne Univ., Parkville (Australia).

S. D. Clark, and I. Meacham.

In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 243-254, 1971.

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

The Australian Senate Select Committee on Water Pollution reported in 1970 on the lack of effective control over water pollution throughout Australia. One form of administrative structure at the State level to combat these dangers is the central administration set up by the Environment Protection Act, passed by the Victorian Parliament in 1970, to Act, passed by the Victorian Parliament in 1970, to cover all aspects of environmental pollution. At the inter-State and Commonwealth-State levels there are special legal and administrative problems to be faced. Control of salinity on the River Murray will depend on a practicable solution to these problems being found. A satisfactory administrative structure to operate at these levels could be built on the appearance and advice of central pollubuilt on the experience and advice of central pollu-tion-control administrations, established within the separate States. (See also W72-11755) (Knapp-USGS)

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT,
Water Conservation and Irrigation Commission,

Water Conservation and Irrigation Commission, Sydney (Australia). H. N. England. In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 257-273, 1971. 9 ref.

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C—Use of Water of Impaired Quality

Salinity, from a management viewpoint, is discussed under the headings of hydrology, use of saline waters, and control of soil and stream salinity, with incidental reference to other Symposium papers. The main theme is the conflict between control of soil salinity under irrigation and downstream river salinity, with the conclusion that the high quality of Australian surface waters should be preserved at the expense of minor loss of land to salt in the semi-arid floodplain environment, where most irrigation development and potential are situated. (See also W72-11755) (K-

AND WATER USE: FUTURE RESEARCH DIRECTIONS,

Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Soils. A. E. Martin.

A. E. Marun.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 275-284, 1971. 20 ref.

*Salinity, Descriptors: Descriptors: "Salinity, "Water utilization, 'Research and development, 'Water resources development, Irrigation water, Municipal water, Desalination, Groundwater, Land reclamation, Land management, Water management (Applied), Geochemistry, Water quality, Australia.

Future research directions in salinity at the molecular level are already predetermined, and will probably concern the details of ion pumping in cell membranes, the development of new antibiotics, the emergence of salt-tolerant plants and the like. The real problems lie in the catchments and will need the application of terrestrial field research for their solution. A brief analysis of the status of field research is presented and some reasons for its unpopularity are suggested. New research should concentrate on the location of saline soils, sediments and groundwaters more intensively than hitherto, on the origin of terrestrial salt, on the factors responsible for secondary salinity in soils, water supplies and irrigation areas, and on the criteria for evaluating salt-affected soils and techniques for their reclamation. There is acute need for research on the social consequences of a contracting population in irrigation enterprises that ,uffer partial failure. (See also W72-11755) (Knapp-USGS)

SPECIFIC STRUCTURAL ALTERATIONS OF THE CHLOROPLASTS OF SPINACH LEAVES BY NEUTRAL SALTS,

California Univ., Davis. Dept. of Food Science

and Technology.
V. J. Yao, C. Sterling, and C. R. Stocking.
Physiologia Plantarum, Vol 26, No 2, p 191-199, 1972. 21 fig, 26 ref.

Descriptors: *Membrane processes, *Salts, *Structural analysis, *Ions, *Water structure, Physicochemical properties, Potassium, Chlorides, Proteins, Lipids, Plant physiology. Identifiers: *Chloroplasts, *Neutral salts.

The mechanism of salt action on biological structure is still not entirely clarified. It is generally felt that 2 broad categories of interaction exist: salts may alter the structural and chemical properties of may are the structural and chemical properties of the solvent or they may react directly with certain membrane electrostatic structures. Freshly iso-lated spinach chloroplasts were treated with neutral salt solutions at 1 and 2 M concentrations for ultrastructural study using high-resolution microscopy. The salts used were KCl, KSCN, KI and sodium trichloracetate. Each salt induced a unique pattern of structural disruption, and these are detailed. The structure of chloroplast mem-branes is characterized by highly polar faces and a strongly hydrophobic inner core. Consideration of the membrane protein-lipid structure suggests that electrostatic groups may be available for reaction with hydrated ions. (Casey-Arizona) W72-1236a

3D. Conservation in Domestic and **Municipal Use**

FUTURE PLANNING OF WATER RESOURCES AT THE REGIONAL WATER DISTRICT LEVEL,

Stanford Univ., Calif. Dept. of Civil Engineering.

Journal of the American Water Works Associa-tion, Vol 59, No 4, p 433-439, April 1967. 2 tab, 3

Descriptors: *Cities, *Water resources develop-Descriptors: "Clues, "water resources development, water districts, "Water sources, Water supply, Economics, Water management, Drought, Payment, Unit costs, Water rates, Metropolitan Water District of Southern California, Northeast Identifiers: Metropolitan New York.

Population increases of suburbs of metropolitan cities coupled with drought have resulted in severe local shortages of water. Regional water districts are suggested to solve this problem by expanding sources and increasing financial bases. Several such regional districts are cited. New sources need to be developed including groundwater exploita-tion and desalting of sea or brackish waters. Where regions extend beyond state lines Interstate
Water Authorities should be provided through
enabling legislation. Price of water should be set equal to marginal cost of service. Public education is needed to inform users of true costs of water supply and requirements for planning. (Flack-AW-WARF) W72-11884

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION, Colorado Univ., Boulder. Dept. of Civil Engineer-

or primary bibliographic entry see Field 06D. W72-11888

NORTHEAST WATER CRISIS AND ITS SOLU-R. J. Faust

Journal of the American Water Works Association, Vol 58, No 1, p 3-7, January 1966. 1 tab.

Descriptors: *Droughts, *Water supply, *Rainfall, *Water resources development, *Water shortage, *Water resources, *Water supply, *Northeast U.S., *Water storage, *Planning, *Political aspects, New York, Treatment facilities, Financing, New England, Water conservation, Water distribution (Applied), Rivers and Harbors Act.
Identifiers: Northern New Jersey, Philadelphia, Baltimore, Meters Baltimore, Meters.

The Northeast is not running out of water - the shortages are in facilities not in water. Droughts can be planned for if management will take a conservative long-range approach. Contrary to Congressional statements ample supplies are available and federal intervention is not necessary. Baltimore and Philadelphia have excellent planning and management. Boston needs to pay more atten-tion to future needs especially facilities. Northern New Jersey and New England have ample supplies and need improved facilities. New York, however, is beset with complex and politically difficult problems. The New York metropolitan area needs qualified management now. Eventually a metropolitan water authority including Conneticut, New York and New Jersey should be established. (Flack-AWWARF) established. W72-11890

DUAL WATER SYSTEMS Black and Veatch, Kansas City, Mo. P. D. Haney, and C. L. Hamann. Journal of the American Water Works Associa-tion, Vol 57, No 9, p 1073-1098, September 1965. 16 tab, 46 ref. US AS TE VO No and Fo

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Descriptors: *Dual system, *Water quality, *Pota-ble sumply. *Water source, *Desalination, Descriptors: "Dual system, "Water quality, "Pota-ble supply, "Water source, "Desalination, "Demineralization, "Desalination processes, "Cost comparisons, "Distribution systems, "Water supply, "Cost analysis, "Water demand, Hardness (Water), Chemical analysis, Taste, Odor, Water softening, Domestic water, Water utilization.

Identifiers: Brackish water conversion, Mineral content, Bottled water, USPHS Drinking Water Standards, Culver City (Calif), Buckeye (Ariz), Coalinga (Calif), Webster (SD), University of Wisconsin, Cincinnati (Ohio), Wichita (Kans).

The feasibility was determined of two water supply systems, one to supply potable water for domestic use and the other to supply non-pota water for all other uses. Dual systems have been proposed as long ago as 1894 and are currently in use in Coalinga, California, Avalon on Catalina Island, the University of Wisconsin and Grand Canyon Village, Arizona. Based on cost com-parisons developed in this study dual systems ap-pear economically justified where source supplies are highly mineralized and/or have severe taste and odor problems. Most feasible are those loca-tions which have a limited potable supply and an abundant mineralized non-potable source such as sea or brackish water. (Flack-AWWARF) W72-11904

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED STATES, 1962,

Geological Survey, Wash., D.C. Water Resources

C. N. Durfor, and E. Becker.

Journal of the American Water Works Association, Vol 56, No 3, p 237-246, March 1964. 5 tab, 6

Descriptors: *Water supply, *Water treatment, *Population, *Radiochemical analysis, *Trace elements, Human population, Groundwater, Surface waters, Hardness (Water), Dissolved solids, Sodium, Water softening, Calcium, Magnesium, Hydrogen ion concentration, Spectroscopy. Identifiers: *Finished water.

Public water supplies of the 100 large,t cities in the United States serve 60 million people, or 34 per-cent of the nation's population. The Geological Survey has recorded data on these cities and their water use. Included in this summary are data on population, supply, chemical, spectrographic and radiochemical analysis, and concentration of selected characteristics of finished water including hardness, dissolved solids and sodium. Population served by various forms of treatment for surface, ground and combined sources is given. Trace element data are presented along with pH measure-ments. (Flack-AWWARF)

WATER SUPPLY ECONOMICS, TECHNOLO-GY AND POLICY, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 06B. W72-11913

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020, Geological Survey of Alabama, University For primary bibliographic entry see Field 06B. W72-11979

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CON-TROL AND CITY WATER SUPPLY RESER-VOIR,

North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning. For primary bibliographic entry see Field 04A. W72-12030

HIGH RATE FILTRATION OF COMBINED SEWER OVER_TLOWS, Hydrotechnic Corp., New York. For primary bibliographic entry see Field 05D. W72-12191

THE URBAN SYSTEM, Martin Marietta Co., Denver, Colo. For primary bibliographic entry see Field 06A. W72-12221

THE URBAN WATER SYSTEM--TECHNICAL ASPECTS, Water Resources Engineers, Inc., Walnut Creek, Calif. For primary bibliographic entry see Field 06A. W72-12222

THE URBAN WATER SYSTEM-ECONOMIC ASPECTS, Water Resources Engineers, Inc., Walnut Creek, Calif. For primary bibliographic entry see Field 06A. W72-1223

THE SYSTEMS APPROACH,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-12224

MANAGEMENT MODELS, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 06A. W72-12225

MATHEMATICAL MODELING, Geological Survey, Fort Collins. For primary bibliographic entry see Field 06A.

OPTIMIZATION TECHNIQUES, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-1227

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THE MACRO APPROACH--URBAN WATER DEMAND MODELS, Oklahoma Univ., Norman. School of Civil and Environmental Science. For primary bibliographic entry see Field 06A. W72-12228

THE MICRO APPROACH—COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIRE-MENTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 06A.
W72-1229

APPLICATIONS OF LINEAR PROGRAMMING, OR LINEAR POTPOURRI, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-1230 LINEAR PROGRAMMING: GENERAL CON-CEPTS AND METHODS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A.

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY, Denver Board of Water Commissioners, Colo. For primary bibliographic entry see Field 06A.

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12233

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES, Illinois University, Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12234

NONLINEAR PROGRAMMING AND SEN-SITIVITY ANALYSIS, Pennsylvania State Univ., University Park. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12235

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICA-TIONS TO PROCESS ANALYSIS AND CON-TROL, Pennsylvania State Univ., University Park. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12237

SOCIAL PROCESSES IN WATER MANAGE-MENT SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Sociology. For primary bibliographic entry see Field 06A. W72-1238

3E. Conservation in Industry

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06B. W72-11979

WATERPOWER RESOURCES OF THE USSR, For primary bibliographic entry see Field 06B. W72-12024

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUN-TIES, GEORGIA, 1966-70, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 04B. W72-12384

3F. Conservation in Agriculture

KNOW YOUR SPRINKLER APPLICATION RATES,
Texas Agricultural Extension Service, College Station.
L. New.
Inrigation Age, Vol. 6, No. 6, p. 58-59, 62-63, 66-69, Jan 1972. 1 photo, 3 tab.

Descriptors: *Sprinkler irrigation, *Rates of application, On-site tests, Nozzles, Root zone, Irrigation water, Discharge measurement, Discharge (Water), Pressure, Pressure head, Irrigation practices, *Irrigation operation and maintenance, Irrigation.

rigation.
Identifiers: *Water application rates, Spacing, Soil water storage, Soil-water relationship, Irrigation requirement.

Irrigation water must be applied in the quantities and at the times which best fill plant moisture needs. Application rates are the basis for determining the depth of irrigation water applied during a specified time. The rate also determines the time the system should set in one location to fill the soil's water-holding reservoir. The application rate is controlled by the line pressure, sprinkler nozzle size, and sprinkler spacing. A change in any of these components affects the application rate. A simple field method is given to determine the discharge from each nozzle. For a known discharge, the application rate and the time of set can be determined from the given tables. Application rates and times of set must be correlated with the holding capacity of the soil-root zone. The soil-root zone is the water reservoir for the day-by-daplant use. Soil water reservoirs are measured in inches of water per foot of soil depth. Typical sandy loam soils have water reservoirs of 1,0 to 1.5 in. of water per foot of soil depth. Assuming a 4-ft soil-root zone, the total water capacity of this soil is 4 to 6 in. A table shows water available to plant roots for various soil textures. (USBR)

EFFECTS OF THE USE OF AGRICULTURAL PESTICIDES ON WATER POLLUTION, State Coll. of Agronomical Science, Gembloux (Belgium). For primary bibliographic entry see Field 05C. W72-11788

PREDICTION OF INCREASES IN SURFACE-I-RRIGATION EFFICIENCY, California Univ., Davis. T. Strelkoff.

Paper, American Society of Civil Engineers National Water Resources Engineering Meeting, Atlanta, Ga. Jan 1972. 22 p, 8 fig, 11 ref.

Descriptors: *Surface irrigation *Irrigation efficiency.*

Descriptors: "Surface irrigation, "Irrigation efficiency, "Hydraulics, "Flow duration, "Flow profiles, Furrow irrigation, Border irrigation, Infiltration, Infiltration rates, Flow, Soil surfaces, Computer models, Mathematical anlaysis, Return flow, Irrigation engineering. Identifiers: Flow depth, Shape factor, Wetting front, Water application rates.

Vast quantities of water are used for surface irrigation, but 1/2 to 3/4 of the total water is not needed for crops and is lost. As the stream of water runs down the field, water infiltrates the ground at a rate governed primarily by the time elapsed since the passage of the wave front. The depth of infiltration at each point then depends on the time between passage of the leading and trailing edges of the surface stream. Generally, the infiltration time varies over the field; therefore, if every portion of the field is supplied with the required amount of water, some areas will be overirrigated. Four computer techniques are compared showing stream advance calculated by the volume-balance, kinematic-wave, zero-inertia and

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complete hydrodynamic equations. Computer modeling helps determine the effects of these options on water application efficiency. Good results can be obtained with the volume-balance technique if ground slopes are relatively steep and moderately rough. The kinematic-wave method, which costs more to run than the volume-balance is not recommended. The zero-inertia model is less expensive to operate than solving the complete hydrodynamic equations, and yields equally accurate results under typical conditions. (USBR) W72-11789

WEED CHEMICAL CONTROL IN MAIZE CROPS UNDER THE CONDITIONS OF THE LOW TERRACE LAND ALONG THE DANUBE

Bulgarian Academy of Sciences, Kostinbrod. Inst

of Plant Protection.

J. Lyubenov, M. Marinov, and R. Marinova.

Rastenievod Nauki. Vol 7 No 9 p 113-125. 1970. IIlus. English summary.

Identifiers: *Chemcontrol, Cirsium arvense D, Control, Convolvulus arvensis D, Crops, Danube River, Land Maize-M, Terracing, Weed control.

The effects of atrazine and different tillage during the growing season on the dynamics of the soil moisture, the development and the yield of maize grown for grain were studied. Atrazine applied at a dose of 3 kg/ha 50% as wetted powder in years with normal rainfall may practically remove the competition of annual weeds. The introduction of atrazine in rows or dispersed over the whole plot created conditions for dropping off the hoeing in the rows and for growing maize with only one interrow cultivation during the growing season. Cultivation removed the perennial weeds resistant to atrazine, e.g. Cirsium arvense L., Convolvulus arvensis L. and others. In plots treated with atrazine and uncultivated during the growing season, espe-cially during prolonged droughts, the soil is better water-supplied than in untreated and cultivated plots. The application of atrazine maximally reduced the harmful delayed hoeing of maize in the spring. At the same time a 12 day delay of hoeing of untreated plots reduces sharply the yield.— Copyright 1972, Biological Abstracts, Inc. W72-11818

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE EN-VIRONMENT.

Univ., Lincoln. Water Resources Nebraska Research Inst.

For primary bibliographic entry see Field 05C. W72-11880

EMERGENCE AND SURVIVAL OF COOL SEASON GRASSES UNDER DROUGHT STRESS

Vermont Univ., Burlington. Dept. of Plant and Soil Science.

G. M. Wood, and P. A. Kingsbury. G. M. Wood, and P. A. Kingsbury.
Agron J., Vol 63, No 6, p 949-951, 1971. Illus.
Identifiers: *Drought resistance, *Moisture stress,
Dactylis glomerata M. Dormant, Droughts,
Elymus junceus M. Emergence, Grasses M,
Quiescent, Season, Seeds, Survival, Wildrye M.

Alternating moist and dry periods were used to evaluate 19 grasses, including 6 genera and several cultivars of some, in a growth chamber experi-ment. Two types of drought tolerance were demonstrated: drought tolerance of seedlings and presence of dormant or quiescent seeds that can survive alternate dry and moist period. A grass significantly higher in the first type of drought re-sistance was 'Sawki' Russian wildrye (Elymus junceus Fisch.). Pennlate orchardgress (Dactylis glomerata L.) showed a very high degree of drought tolerance of the second type.—Copyright (c) 1972, Biological Abstracts, Inc. W72-11882

ON THE OUESTION OF COTTON INTER-

ROWS, Academy of Agricultural Sciences, Chirpan (Bul-garia). Inst. of COTTON. P. Deshkova.

Rastnievod Nauki. Vol 8 No 4, p 81-89, 1971. Illus.

(English summary). Identifiers: Cotton D, *Interrows, Irrigation, Crop response, *Crop production.

The 60 cm interrow spacing has numberous advantages over wider (80 or 100 cm) interrow spacings from the point of view of agricultural technology and the existing techniques in cotton growing. Cotton growing at 80 cm interrow spacing delays ripening. With dry farming the yield from the first picking drops by 8.25% and under irrigation by 17.40% compared with the 60 cm row standard. Total yield is equal to that of 60 cm interrow spacing. Cotton, grown at 100 cm interrow, matures later and in comparison with 60 cm interrow spacing produces lower first picking yields both under farming (16.22%) and under irrigation (32.31%). Total yield under dry farming is equal to that of the standard while under irrigation it is 5.24% lower.--Copyright (c) 1972, Biological Abstracts. Inc.

THE EFFECT OF TECHNIQUES OF ROOT IM-PROVEMENT OF SANDY SOIL ON WATER STATUS AND CROP YIELDS.

V. A. Tikavyi.

V. A. 11Kavyl.
Dokl Mosk Sel'Skokhoz Akad Im K A
Timiryazeva. 142. p 31-36. 1968.
Identifiers: *Crop production, Fertilizers, *Fertilizing, Moisture, Oats M, Plowing D, Roots, Rye
M, Sands, Soils, Techniques, Vetch D, Winter.

In field experiments carried out in 1966-1967 by the All-Union Institute of Potato Growing on sandy-loamy soil, studies were made of the effect of farmyard manure and peat introduced to a depth of 45 cm in spring or 35 cm in autumn. The deep placement of organic fertilizers provided better conditions for accumulation of moisture and improved soil moisture capacity. WITH DEEPLY PLACED ORGANIC FERTILIZERS THE YIELDS OF WINTER RYE, POTATOES, OATS AND THE VETCH=OAT MIXTURE WERE NEARLY +.% TIMES HIGHER THAN IN USUAL PLOWING UNDER OF 60 TONS FAR-MYARD MANURE PER HECTARE TO A DEPTH OF 22 CM. == Copyright 1972, Biological Abstracts, Inc.

EFFECTS OF SOILS ON FORAGE UTILIZA-TION IN THE DESERT GRASSLAND, Benson Union High School, Ariz.

J. L. Vandermark, E. M. Schmutz, and P. R. Ogden.

J Range Manage. Vol 24, No 6, p 431-434. 1971. Il-

Identifiers: Bouteloua gracilis M, Cattle, Curlymesquite M, Desert, *Forages, Grama M, Grasslands, Hilaria belangeri M, *Soils.

This study was made in southeastern Arizona to determine some of the factors affecting utilization by cattle of 2 key species on 3 desert grassland soils. Macronutrient content of the soil and the plants, and corresponding utilization of blue grama (Bouteloua gracilis) and curlymesquite (Hilaria belangeri), were always significantly greater on the Pima bottomland soil than on the 2 upland soils, but they were not always significantly different between the 2 upland soils. No consistent relationships were found between forage utilization and micronutrient, sugar or starch content in the plants.—Copyright 1972, Biological Abstracts, Inc. W72-11908 RESPONSE TO WHEAT VARIETIES TO DIF-FERENT FERTILITY LEVELS UNDER UNDER

RAINFED CONDITION,
Wheat Research Station, Pawarkhera (India).
S. P. Singh, K. P. Gupta, S. P. Kurchania, and S. C. Jethmalani

Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4 No 1/2 p 12-14. (1971). Identifiers: *Crop production, *Fertilization, In-dia, Nitrogen, Phosphate, Rainfed, Varieties, Wheat M.

A trial to study the response of wheat varieties to varying levels of fertility under rainfed conditions was conducted from 1964-65 to 1966-67. A dose of 33.5 kg N and 33.5 kg P2O5/ha increased the yield significantly over the control and 16.75 kg N + 16.75 kg P2O5/ha. 'Hy 65,' 'N.P. 839' and 'Hy 633' were superior to other cultivars tested.—Copyright 1972, Biological Abstracts, Inc. D*III WPLEIGST

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THE EFFECT OF (2-CHLOROETHYL)
TRIMETHYLAMMONIUM CHLORIDE (CCC) ON THE GROWTH AND YIELD OF WHEAT, Adelaide Dept. of Agriculture (Australia)

J. E. Schultz.

Aust J Exp Agric Anim Husb. Vol 11, No 51, p 450-454, 1971. Illus. Identifiers: Growth, Wheat M, Crop production, *Crop response, * (2-Chloroethyl) Trimethylammonium chloride.

The effect of CCC on the growth of wheat in South Australia was assessed in 3 yr, 1967-1969. A significant grain yield response was obtained only in the wet year, 1968, and was attributed to in-creased grain weight. The delay in heading and leaf senescence which occurred in CCC-treated plants perhaps allowed a greater assimilation of water and nutrients, thus producing the heavier grains. The lack of response in grain yield in 1967 and 1969 was probably due to moisture during grain filling. CCC reduced crop height significantly in 1968 and 1969, but not in the very dry year, 1967. Split applications might be more useful than the single applications used in these experiments. Although CCC can give small increases in yield under some conditions, it is unlikely to be of commercial importance for wheat-growing in South Australia.--Copyright 1972, Biological Abstracts, W72-11953

CORRELATION BETWEEN YIELD AND YIELD COMPONENTS IN WHEAT (T. AESTIVUM) UNDER RAINFED CONDITION, Wheat Research Station, Pawarkhera (India). S. P. Singh, S. V. Velanker, and M. S. Srivastava. Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4, No 1/2, p 20-21. (1971). Identifiers: *Crop production, Components, Date, Grains, India, *Rainfed, Tillers, Triticum aestivum M, Weight, Wheat M.

Correlation between heading date, tillers/plant, spikelets/ear, 1000-grain weight and yield/plant in wheat (Triticium aestivum) was studied under rainfed conditions. Grain yield was highly and positively correlated with number of grains/ear and 1000-grain weight. A significant positive corand 1000-grain weight. A significant positive correlation was noted between heading date and number of tillers/plant. Number of tillers/plant was negatively correlated with 1000-grain weight.—Copyright 1972, Biological Abstracts, Inc. W72-11988

CONSUMPTIVE USE BY IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING.

Wyoming Univ., Laramie. Water Resources Research Inst. For primary bibliographic entry see Field 02D.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

HYDROLOGY OF IRRIGATED LAND (GIDROLOGIYA OROSHAYEMYKH ZEMEL'). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 170, S. I. Kharchenko, editor, 1971. 128 p.

Descriptors: *Hydrology, *Hydrologic cycle, *Agriculture, *Irrigated land, Irrigation practices, Irrigation practices, Irrigation systems, Sprinkler irrigation, Irrigation water, Groundwater, Soil water, Soils, Crops, Meteorology, RaTION, Precipitation (Atmospheric), Evaporation, Lysimeters, Methodology, Analytical techniques, Equations.

Equations.

Identifiers: *USSR, Kazakhstan, Rostov Oblast, Stavropol' Territory, Lysimetry, Soil monoliths, Thermoisopleths.

This collection of 6 papers provides information on water balance of agricultural lands and on methods for measuring and calculating various hydrometeorological elements. Specific topics discussed are: (1) tests of a hydrometeorological method to determine the irrigation regime of row crops in the Rostov Oblast in 1966-67; (2) groundwater recharge resulting from irrigation of a cotton field on the Arys'-Turkestanskiy tract in the Chim-kent Oblast in Kazakhstan, 1967-69; (3) represenkent Oblast in Kazakhstan, 196/-69; (3) represen-tativeness of lysimeter measurements of evapora-tion in the Stavropol' Territory in 1966-69; (4) techniques for calculating precipitation and irriga-tion water during lysimetry; (5) application of small sprinkers for investigation of soil uptake of atmospheric precipitation and irrigation water; and (6) methods for calculating total solar radiation for short periods of time. (Josefson-USGS) W72-12019

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RELATIONS BETWEEN FE IN IRRIGATION WATER AND LEAF QUALITY OF CIGAR WRAPPER TOBACCO,

Agricultural Research and Educational Center, Quincy, Fla. F. M. Rhoads

Agron J., Vol 63, No 6, p 938-940, 1971. Illus. Identifiers: Algae, Cigars, *Iron, *Irrigation, *Crop production, Leaves, Manganese, Nicotiana labacum D, Relations, Tensile strength, Tobacco

Damage, appearing to result from irrigation water, reduced the value of cigar wrapper tobacco (Nicotiana tabacum L.) in 1969. Dark leaf tips and dark spots over the entire leaf rendered damaged leaves unfit for wrapper use. Leaf analysis indicated that Fe and Mn were associated with the dark coloration. A study was made in 1970 to determine the effect of Fe in irrigation water on quality of cured wrapper tobacco leaves and to find a potential wrapper tobacco leaves and to find a potential source of Fe contamination of irrigation ponds. Two forms of Fe were added to irrigation water applied to field plots, and Fe content of leaves, leaf quality, and leaf tensile strength were used to evaluate the effects. Soil and organic material were collected from a shallow area of a 'problem' pond, after it had been drained, for use in laborations of the properties. Decreated tobacce, similar to that obpond, after it had been drained, for use in above tory studies. Damaged tobacco, similar to that ob-served in commercial fields, was produced in field plots in 1970 when Fe was added to the irrigation water. Laboratory incubation studies showed that pond sediments were a potential source of Fe buildup in irrigation water. Leaf strength decreased with increasing content of Fe in the tissue. A visible coating was produced on green leaves in the greenhouse when 5 and 10 ppm Fe in water were sprayed on the plants.--Copyright 1972, Biological Abstracts, Inc. W72-12028

ROOT GROWTH AND SOIL STRUCTURE UNDER DIFFERENT TILLAGE OPERATIONS AND UNIFORM APPLICATION OF FERTILIZER,

Indian Agricultural Research Inst., New Delhi. D. Subbarami Reddy, and C. Dakshinamurti.

Indian J Agric Sci. Vol 41, No 5, p 413-422, 1971.

Illus. Identifiers: *Crop production, *Cultivation, Fertil-izers, Grains, Growth, Maize M, Operations, Root development, Soils, Structure, Tillage, Triticum-aestivum M, Wheat M,Zea MAYS M.

Under uniform application of fertilizer on the rain-fed soils the influence of different plowing treatments, deep plowing, moldboard plowing, discing, discharrowing and local (desi) plowing on the root-growth factors, soil structure in the rhizo-sphere and yield of maize (Zea mays L.) followed by wheat (Triticum aestivum L.) was studied. All by wheat (Thuchin assistance), as studied, which is the factors in both the crops were significantly higher with deep plowing, followed by the mold-board plowing. Root penetration was better because of improvement in the soil structure in the rhizosphere, and a significant correlation between root growth and soil structure was observed. Im-proved soil structure increased the grain yields in crops grown under different treatments, and there was a significant correlation between the 2 factors. Thus deep plowing, in sandy-loam soils under rainfed conditions, proved significantly superior to other plowing treatments studied.—Copyright 1972, Biological Abstracts, Inc. W72-12038 was a significant correlation between the 2 factors.

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.

For primary bibliographic entry see Field 05B. W72-12042

DIFFERENTIAL RESPONSE OF RAGI VARIE-TIES TO SEED HARDENING, University of Agricultural Sciences, Bangalore

(India).
B. G. Rajashekara, M. G. Rajappa, S. Ramarao, K. S. Krishna Sastry, and K. N. Mallanna.
Mysore J Agric Sci. Vol 5, No 2, p 187-192. 1971.
Identifiers: Grains, Hardening, Ragi M, Rainfall,
*Seeds, Varieties, *Crop response, Crop produc-

The responses of ragi cultivars to seed hardening The responses of ragi cultivars to seed hardening under rainfed conditions were examined. 'Purna,' 'IE-817,' and 'H-22' responded consistently well to seed hardening and 'IE-267' did not respond at all. Other cultivars, 'IE-237,' 'ES-11,' 'IE-810' (white ragi) responded with slight increases in grain yield, only in years of low rainfall. The maximum response was in ear weight.--Copyright 1972, Biological Abstracts, Inc. W72-12078

OBSERVATIONS ON THE BEHAVIOR OF THE SPECIES SORGHUM ALMUM PARODI UNDER THE ECOLOGICAL CONDITIONS OF CLUJ (BULGARIA),

Institutul Agronomic Dr. Petru Groza, Cluj (Ru-V. Popescu, and M. Albu.

Comun Bot. 12: p 533-538. 1971. Illus. Identifiers: *Crop production, Behavior, Bulgaria, Cluj (Bulgaria), Corn-M, *Ecology, Sorghum almum M, Sorghum sudanense M, Sorghum vulgare M. Species.

Sorghum almum Parodi is appreciably influenced in its development by the quantity of precipitation in spite of ts thermophilous nature. For growth in length of 1 cm, the temperature varied from 4.6 to 12 C in 1966 and from 12.8 to 17.3 in 1967 during the different phases of growth. The precipitation the different phases of growth. The precipitation for this growth ranged from 0.5-1.0 mm during the first yr and from 0.1-1-2 cm during the second yr of experimentation. The production of green mass in this plant was 23.3 tons/ha, which was practically equal to that of Sorghum vulgare and S. sudanense, but slightly lower than that of corn (27.5 t/ha).—Copyright 1972, Biological Abstracts, Inc. W72-12080

WATER UPTAKE AND GROWTH OF SUGAR BEET, (IN FRENCH), Institut National de la Recherche Agronomique, Clermont-Fernand (France). Centre de Recherches Agronomiques du Massif-Central. M. Robelin, and M. Mingeau.

1.I.R.B. Rev Inst Rech Betteravieres. Vol 5, No 2, p 71-86. 1970. Illus. English summary. Identifiers: Beet D, Growth, Sugar, "Moisture uptake, "Crop production, Irrigation.

The maximum evapotranspiration (ETM) of a crop is its water uptake at field capacity under the climatic demand, when the soil supplies sufficient water to the plant. The potential evapotranspiration (ETP) may be determined and depends on climatic conditions. ETM is defined by ETP, leaf area and leaf activity and also by soil moisture when the soil is not completely covered with leaves. The relations between crop production inrelations between crop production indices and the water uptake index were examined dices and the water uptake moex were examined with respect to dry matter, fresh root yield and sugar yield. The relation is linear in the first 2 cases and curvilinear in the last. During dry condi-tions, the decrease in photosynthesis first affects the elaboration of tissues resulting in less accumulation of metabolic products. Sugar content increases when water uptake diminishes from 100 to 75% of ETM. There is a sudden fall after this level. 75% of ETM. There is a sudden fall after this level. Under dry conditions, there is a decrease in growth but this may be compensated for by accelerated growth as soon as the water uptake becomes normal again. This phenomenon suggests the use of discontinuous irrigations. The experimental results were confirmed by a survey on the effects of the rainfall distribution on sugar beet yield.—Copyright 1972, Biological Abstracts, Inc. W72-12086

THE EFFECT ON GROWTH AND YIELD IN RICE FLOODING, (IN KOREAN), Chonnam Office tar Rural Development, Kwangju

(Korea).

(Korea). Y. S. Kim, and D. J. Yoo. Res Rep Off Rural Dev (Crop) (Korea). 13, p 23-30. 1970. Illus. English summary. Identifiers: *Flooding, Growth, *Rice-M, Crop production, Crop response.

The worst flooding damage occurred when the rice plants were completely submerged in water at the booting stage.—Copyright 1972, Biological Abstracts, Inc. W72-12088

IRRIGATION OF SUGAR BEET ON LIGHT

SAND SOIL, P. N. Harvey, and L. W. Wellings. Exp Husb. 19, p. 1-12. 1970. Illus. Identifiers: *Irrigation, Sands, Soils, Sugar beets, *Crop production, Crop response.

The average response to water in 11 yr was just over 1 ton of clean beet/acre in. of water applied. If the difference between the total rainfall in July, Aug. and Sept. and the calculated potential transpiration for these 3 mo. is 2 in. or less, there is little response to watering. If the deficiency rises to 4 in., good responses can be expected, and if to 6 in. very large responses are probable.—Copyright 1972, Biological Abstracts, Inc. W72-12091

SOIL ASSOCIATIONS AND LAND CLASSIFI-CATION FOR IRRIGATION, SAN MIGUEL COUNTY, New Mexico Agricultural Experiment Station,

University Park.

H. J. Maker, P. S. Derr, J. U. Anderson, and V. G. Link

Link. Available from the National Technical Informa-tion Service as PB-211 162, \$3.00 in paper copy, \$0.95 in microfiche. Agricultural Experiment Sta-tion Research Report 221, New Mexico, State University, Las Cruces, New Mexico, 1972, 44 p, 9 fig, 7 tab, 8 ref. OWRR B-015-NMEX (19).

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.

Identifiers: *San Miguel County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in San Miguel County, New Mexico for irrigation.
The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The irrigation land classes were assigned primarily on the basis of the data available from the general soil map. Although such maps are often made by generalizing from large-scale detailed soil maps, detailed soil surveys were available only on approximately one-half of the land in San Miguel County. In those parts of the county not covered by detailed soil surveys, the general soil map was prepared on the basis of a field reconnaissance, together with interpretation of airphotos, topographic maps, geological maps, and other available information. The data were or-ganized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. San Miguel County has about 3,050,900 acres, of which about 44 percent were considered suitable for irrigation About 177,995 acres were in irrigation class 1; 419,084 acres in class 2; 305,680 acres in class 3; and 444,571 acres in class 4. The remaining 1,703,570 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color are included. (Creel-New Mexico State)

ABSORPTION OF COPPER, ZINC, MANGANESE, BORON, COBALT AND MOLYBDENUM, BY CROPS IN THE TSELINOGRAD REGION

P. G. Grabarov.

Tr Inst Pochvoved Akad Nauk Kaz SSR, 18: p 54-

Identifiers: *Absorption, Boron, Cereals, Cobalt, Copper, *Crops, Fodder, Legumes D, Manganese, Molybdenum, Pulse D, Tselinograd, USSR, Zinc,

Studies of the straw and kernels of grains, pulses and fodder crops for 6 yr revealed a greater accu-mulation of Zn, Cu and Mo in grain than in straw, but the opposite relationship was obtained in the case of Mn and B. The Co contents were approximately equal in straw and grain. The uptake of trace elements increased in wet years; it also increased with higher crop yields. Data are reported on the uptake of trace elements by cereals, pulse crops and legumes.—Copyright 1972, Biological W72-12112

TOLERANCE AND SELF-TOLERANCE OF CEREALS UNDER IRRIGATION CONDITIONS, Institute of Water Engineering and Land Improvement, Sofia (Bulgaria)

G. Georgiev Rastenievod Nauki. Vol 7, No 9, p 13-24. 1970. En-

Rastenevou Nauka. Vo., Julian Rastenevou Nauka. Vo., Julian Research Landscheiders: *Crop production, Barley M, Cereals, *Irrigation, Maize M, Oats M, Rye M, Sorghum M, Tolerance, Wheat M, Crop response, Re-

The tolerance and self-tolerance of 6 cereal crops: wheat, barley, rye, oats, sorghum and maize under irrigation conditions were studied from 1963-1966 on leached cinnamon forest soils. Two backgrounds of fertilization were applied: without fertilization (O) and intensive fertilization (T) with N200P160K120 (kg/ha). Marked self-intolerance was manifested by barley and somewhat by

sorghum. Marked self-tolerance occurred in the rye and somewhat in maize. Wheat was better tolerant to the other cereals. Winter cereals show good tolerance to oats but not reciprocally. Oats manifests good tolerance to spring cereals but only under fertilization. The winter cereals are generally of equal significance as predecessors of the remaining cereal crops. Maize and sorghum are of equal biological significance to the remaining cereal crops, expressed in yield reduction without fertilization and better tolerance under mineral fertilization. Nutrition conditions change the selftolerance and the tolerance of the different cereal crops. Thus maize manifests self-tolerance without fertilization. Sorghum manifests equal intolerance to maize and wheat without fertilization and better tolerance to wheat than to maize under fertilization .-- Copyright 1972, Biological Abstracts, Inc. W72-12113

THE GROWTH OF SUGAR-BEET ROOTS IN TO MOISTURE EXTRACTION RELATION

FROM THE SOIL PROFILE,
Broom's Barn Experiment Station, Bury St. Edmonds (England).

A. P. Draycott.

I.I.R.B. Rev Inst Int Rech Betteravieres. Vol 5, No

2, p. 65-70. 1970. Illus.
Identifiers: *Moisture uptake, *Crop production D, Extraction, Growth, Soil profiles, Roots, Soils,

Periodic measurements of soil moisture were made in sugar beet crops in each of the years 1967-69. The quantity of water (g/cm³) was determined at 5, 10, 15 and 20 cm, and at 10 cm intervals down to 100 cm, using a neutron moderation meter. In all 3 yr moisture was lost from the surface 20 cm mainly by evaporation from bare soil during the period up to singling. During the latter half of May and in early June, sugar beet roots withdrew moisture down to 80 cm and by early July water was extracted down to 100 cm. In the 2 dry years, there was evidence that roots took out some moisture below 100 cm. By integrating the areas between sequential moisture profiles, soil moisture deficits were obtained. These were compared with deficits calculated from meteorological data and suggested that with deficits under sugar beets of less than 15 cm, the root system sustained the water requirement of the crop from soil reserves, except when the deficit increased rapidly in 1967 .- Copyright 1972, Biological Abstracts, W72-12117

EFFECTS OF VARIETY, SPACING AND SOIL FERTILITY ON ROOT DEVELOPMENT IN GROUNDNUT UNDER ARID CONDITIONS.

Central Arid-Zone Research Inst., Jodphur (India). Suraj Bhan, and D. K. Misra.

Indian J Agric Sci. Vol 40, No 12, p 1050-1055. 1970

Identifiers: Arachis hypogaea D, Arid climates, *Root development, Fertility, *Groundnut, Nitrogen, Nodules, Soils, Spacing, Varieties.

The erect cultivar 'AK 12-24' showed more primary and secondary roots and greater root w but was shallower in its penetration. It was inferior to 'PG 1' in nodulation and N content of the roots and nodules. Increased spacing between plants and balanced fertilization with N and P favored the development of roots and nodules and in-creased their N content. The amount of evapotranspiration and pod yield were positively Gorrelated with root growth.--Copyright 1972, Biological Abstracts, Inc. W72-12118

THE EFFECTIVENESS OF SHELTERRELTS IN THE FOREST-STEPPE AREAS,

L. T. Ustynovs*Ka. Visn Sil'S'Kohospod Nauk. 9. p 82-85. 1969.

Identifiers: *Crop production, Oak D, Poplar D, *Shelterbelts, Wheat M, Winter.

Five-row strips with interrows of 1.5 m, with a height of 4 m and a length of 1 km resulted in an increase of yield of winter wheat of approximately 4 tons, and with the height of 6 m, 6-7 tons. These were stable. Strips of fast growing tree species (the poplar species producing no suckers) with 3-4 rows, 2.5 m interrows gave the best results.— Copyright 1972, Biological Abstracts, Inc. W72-12125

PREDICTING RADIOCONTAMINATION OF PLANTS THROUGH RAIN (AND IRRIGATION WATER) (ESTIMATION DU TAUX DE TAN-SFERT DE LA RADIOCONTAMINATION DE LA PLUIE AUX VEGETAUX), SH R SI IC C

Commissariat a l'Energic Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres. For primary bibliographic entry see Field 05B. W72-12197

A MATHEMATICAL MODEL FOR EVALUA-TION OF RADIOACTIVE AND CONVEN-TIONAL POLLUTION OF SURFACE WATERS (MODELLO MATEMATICO PER LA VALU-TAZIONE DI INQUINAMENTI RADIOATTIVI E CONVENZIONALI IN ACQUE SUPERFICIALI), Comitato Nazionale per l'Energia Nucleare, Rome (Italy): and European Communities, Luxembourg.

For primary bibliographic entry see Field 05B. W72-12198

EFFECT OF MULCHES ON WATER CONSER-VATION, SOIL TEMPERATURE AND GROWTH OF MAIZE (ZEA MAYS L.) AND PEARL-MILLET (PENNISETUM TYPHOIDES BURM. F.) STAPF. ET C. E. HUBB.), Punjab Agricultural Univ., Hissar (India). S. P. Bansal, P. R. Gajri, and S. S. Prihar.

Indian J Agric Sci. Vol 41, No 5, p 467-473. 1971.

Identifiers: *Crop production, *Mulching, Conservation, Plastics, Growth, India, Maize M, Mats, Millet M, Mulches, Pennisetum typhoides M, Soils, Straw, Temperature, Typha-M SP, Zea

The effect of mulches on the moisture conservation, soil temperature and growth of maize (2. mays) and pearl-millet (P. typhoides) was studied in twin field experiments on the sandy-loam soil of Hissar in 1967. The mean integrated moisture content was highest under polyethylene mulch and lowest in the control. Straw, encap and cultivation were intermediate to polyethylene and the control. Straw mulch reduced, and polyethylene and encap increased, the maximum soil temperature at 10 cm. Straw mulch applied as 2-cm thick Typha mats increased the maize yield by 15 q (quintal)/ha or 35%, apparently because of its favorable effects on soil temperature. Post-planting shallow cultivation also increased maize yield by 30%. Encap sprayed at the rate of 1.5 1/m sq, or transparent polyethylene sheet spread between rows, increased the soil temperature considerably and did not affect maize yield. None of the mulches sig-nificantly affected the yield of pearl-millet.—Copy-right 1972, Biological Abstracts, Inc. W72-12253

EFFECTS OF WATER SOURCES AND FERTIL-IZERS ON PEANUT PLANTS IN THE GREEN-

Oklahoma State Univ., Stillwater. Dept. of

Agronomy. D. J. Banks, and B. G. Jordan.

Proc Okla Acad Sci. 51: p 47-50. 1971. Identifiers: *Crop production, Fertilizers, Greenhouses, Peanut D, Plants, *Water types.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

Experiments were conducted using different sources of water (tap, lake, distilled, acidified tap, and acidified distilled water) and different fertilizer treatments to seek the best method of growing peanut plants under greenhouse conditions. Distilled water proved to be best; acidification of tap water was beneficial. Use of acidifying soluble fertilizers (21-7-7 and 20-20-20) in combination with distilled water, sand, and plastic pots gave good results.—Copyright 1972, Biological Abstracts Los

STUDIES OF THE FERTILITY OF GENETIC HORIZONS IN ADZHARIAN BUROZEMS AND RESTORATION PRACTICES FOR ERODED

SOILS, I. H. Beridze.

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Subtrop Kul'T. 6. p 123-129. 1969.

Identifiers: *Fertilization Adzharian Burozems, Corn M, *Eroded soils, Fertility, Restoration, Soils, Soybean D, Tobacco D.

Pot experiments with soya demonstrated the high efficacy of mineral fertilizers on genetic horizons of forest burozems. The highest requirement of com and tobacco for N fertilizers occurred on eroded burozems. The highest yields of corn and tobacco occurred in the NPK variant (crop increments of 629 and 526%, respectively). The NP variant produced respective crop increments of 561 and 413%, NK 465 and 367%, and N 141 and 329%.—Copyright 1972, Biological Abstracts, Inc. W72-12315

EAST GREENACRES UNIT, FRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT

STATEMENT).

Bureau of Reclamation, Boise, Idaho.

For primary bibliographic entry see Field 08A.

W72-12336

LOANS TO BE MADE BY THE FARMERS HOME ADMINISTRATION TO RURAL WATER SYSTEM NO. 1, HOSPERS, IOWA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Farmers Home Administration, Washington, D.C.

For primary bibliographic entry see Field 04A. W72-12337

WAX FILAMENTS ON SORGHUM LEAVES AS SEEN WITH A SCANNING ELECTRON MICROSCOPE,

Duke Univ., Durham, N.C. M. F. Sanchez-Diaz, J. D. Hesketh, and P. J.

Journal of the Arizona Academy of Sciences, Vol. 7, No. 1, p 6-7, February 1972. 3 fig, 4 ref.

Descriptors: *Drought tolerance, *Plant morphology, *Electron microscopy, *Sorghum, *Corn (Field), Leaves, Water conservation, Sto-mata, Diffusion, Moisture stress.

In evaluating the causes for the differences in drought tolerance between sorghum and maize, the presence of a white, waxy bloom on the sorghum leaves and leaf sheaths is an obvious starting point. The waxy film can be seen as fila-ments under a light microscope, but with too little ments under a ignt microscope, but with too little detail. Electron microscope photographs of these filaments at 125OX and 12,500X are presented. The wax filaments were 0.8 micron thick and never much longer than 110 microns. The filaments formed a meshwork of clusters on the leaf midribs and near some of the stomata. A picture of mudrbs and near some of the stomata. A picture of a stoma is presented for reference. The wax fila-ments will reflect some radiation, lowering the net radiation, and will thicken the boundary layer of air next to the leaf, thereby increasing resistances to diffusion of water, oxygen, and carbon dioxide in and out of the leaf. Thus drought tolerance should be increased. (Casey-Arizona)

W72-12343

STUDIES OF THE DRIP METHOD OF IRRIGA-

Punjab Agricultural Univ., Hissar (India). Dept. of

I. P. Abrol, and S. P. Dixit. Experimental Agriculture, Vol 8, No 2, p 171-175, 1972. 3 tab, 3 ref.

Descriptors: *Irrigation practices, *Crop response, *Onions, *Root systems, Soil strength, Soil water. Identifiers: *Drip irrigation.

Drip irrigation is the lateral spread of water at slightly above atmospheric pressure, in soil near the root zone of the growing crop, through a system of perforated plastic pipes buried in the soil. A comparison was made of drip and conven-tional check basin irrigation methods, using onion (Allium cepa) and ladies finger (Hibiscus esculen-turn) as test crops. In both cases drip irrigated tum) as test crops. In both cases, drip irrigated plants showed significant superiority in yield and water use efficiency. This was because of greater soil moisture availability at lower tensions and reduced surface evaporation losses. Bulb or root crops may be at any advantage because the wetter soil presents less resistance to expansion. (Casey-Arizona) W72-12347

COASTAL CALIFORNIA EVAPOTRANSPIRA-

TION FREQUENCIES,
Agricultural Research Service, Weslo, Tex. Soil and Water Conservation Research Div.; Agricultural Research Service, Beltsville, Md.; and Agricultural Research Service, Fort Collins, Colo. For primary bibliographic entry see Field 02D. W72-12352

PEAK WATER REQUIREMENTS OF CROPS IN

SOUTHERN IDAHO, Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.

For primary bibliographic entry see Field 02D. W72-12353

WATER DEFICITS-IRRIGATION DESIGN AND

PROGRAMMING, California Univ., Davis. Dept. of Water Science

Cantornia Oniv., Davis. Dept. of water Science and Engineering. R. M. Hagan, and J. I. Stewart. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 215-237, June 1972. 2 fig, 2 tab, 124 ref.

Descriptors: *Irrigation practices, *Evapotrans-piration, *Planning, *Peak loads, *Irrigation pro-grams, Soil moisture, Soil-water-plant relation-ships, Moisture tension, Moisture deficit, Produc-tivity, Economic feasibility, Crop response. Identifiers: *Water use efficiency, *Production functions, *Plant water potential.

Irrigation systems are created with the intention of providing water to crops to prevent the occurrence of crop water deficits that will lead to uneconomic of crop water deficits that will lead to uneconomic yields. Design engineers must deal with the problem of matching the capacities of water dis-tribution and water application to the peak use rates indicated by the peak evaporation rates. Water use efficiency is a prime goal because build-ing increased capacity into distribution and appli-cation systems is very expensive. Economic infor-mation is needed on the expected effects of water deficits on crop yields, which is unfortunately scarce. Two approaches to irrigation programming and design of irrigation system peak capacities to and design of irrigation system peak capacities to meet delivery and application requirements are presented. The first is a comprehensive tabulation of available data on allowable soil water suction. This updates and adds to earlier information. Much of the data shows considerable scatter and it

is obvious that plant water deficits would be better described by plant water potential rather than soil moisture. The conditions of evaporative demand moisture. The conditions of evaporative demand complicate any interpretation of soil moisture in terms of plant moisture stress. The second approach is a continuing research program on preseason irrigation programming techniques and development of water production functions for principal crops, relating yield reductions to water deficits. These functions will vary with type of crop, soil depth and water holding capacity, evaporative demand of the area in question, and with the particular program adopted for times and with the particular program adopted for times and depths of water applications. (Casey-Arizona) W72-12354

AN AUTOMATED SURFACE IRRIGATION VALVE, Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Murphy (Frank W.) Manufacturers, Tulsa, Okla.

For primary bibliographic entry see Field 08C. W72-12355

GENERAL STATEMENT OF PRINCIPLES TO BE INCLUDED IN STATE WATER RIGHTS LAWS.

American Society of Civil Engineers, New York. Committee on Water Laws. For primary bibliographic entry see Field 06E.

SOIL PHYSICAL FACTORS AFFECTING PE-ANUT POD DEVELOPMENT, Auburn Univ., Ala. Agricultural Experiment Sta-

C. V. Underwood, H. M. Taylor, and C. S.

Hoveland.
Agron J, Vol 63, No 6, p 953-954, 1971, Illus.
Identifiers: "Crop production, "Soil physical properties, Arachis hypogaea D, Development, Peanut-D, Pods, Soils.

Effects of crust strength and soil water potential on peg penetration and pod development in peanuts (Arachis hypogaea L.) were evaluated. When fully constrained, pegs developed as much as 13 bars pressure, but under simulated field conas 15 dars pressure, but under simulated tied con-ditions the pegs exerted only 3 or 4% of that pres-sure. In a field experiment the percentage of pegs that penetrated the upper 1.5 cm of pegging zone soil and the weight of pods that developed in the pegging zone decreased as penetrometer re-sistance increased. The rate at which individual pods increased in size was not reduced until soil water potential was reduced to below -15 bars.--Copyright 1972, Biological Abstracts, Inc. W72-12363

ATTAINABLE IRRIGATION EFFICIENCIES, Agricultural Research Service, Brawley, Calif. Im-

perial Valley Conservation Research Center. L. S. Willardson.

Journal of Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 239-246, June 1972. 1 fig, 2 tab, 15 ref.

Descriptors: "Irrigation efficiency, "Root zone, "Uniformity coefficient, "Irrigation systems, Economic feasibility, Political aspects, Infiltration rates, Soil water movement, Sprinkler irrigation. Identifiers: "Trickle irrigation.

The general objective of irrigation is to provide a suitable moisture environment in the soil for plant growth. Since water supplies for irrigation in the arid and semiarid western U.S. have never been as plentiful as irrigators would like, the concept of irrigations. rigation efficiency has received much attention. Irrigation efficiency is considered equivalent to water application efficiency or the percentage of water applied that is actually stored in the root zone for use by the crops. Water application effi-

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

ciency is critically determined by uniformity of field water application in amounts that will not exceed root zone storage capacity. Such uniformity is difficult to attain in surface irrigation if light irrigations are required, if soil infiltration rates are high or if soil intake characteristics vary spatially. Physical, economic and political factors affecting water application efficiency are discussed. Application uniformities of different irrigation systems are discussed. The coefficient of uniformity of are uscussed. The coefficient of uniformity of sprinkler systems vary widely depending on characteristics of the sprinkler system and the water distribution pattern. Trickle systems look promising but uniformity data are not yet available. (Casey-Arizona)
W72-12367

DISTRIBUTION CHANNELS WITH MULTIPLE

OUTLETS, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering; and Pennsylvania State Univ., University Park. Dept. of Civil Engineer-

w. E. Hart, and J. Borrelli.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 267-274, June 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Semiarid climates, *Distribution systems, *Channels, *Irrigation systems, Spill-ways, Furrow irrigation, Ditches, Economic feasibility, *California, Outlets, Hydraulic structures,

Land use improvements in California require agricultural intensification in some portion of the state's approximate 8 million acres of rolling dry foothills. An obvious first step would be irrigated pasturelands, but the economics of such land development dictate an irrigation system with low labor, capital and water requirements. The practical solution to these requirements is a graded supply ditch in which the water is checked at intervals to form bays. When a given bay is checked, the total supply flow is diverted through multiple, equally spaced outlets into field corrugations. The corrugation system is designed to allow simultaneous discharge from several identical outlets equally spaced along a graded open supply ditch. Design procedures for the bays and outlets under a wide set of field conditions are outlined. In order to insure approximately equal outflow from each of the several operating outlets, it is necessary that the head on all outlets be nearly equal. required minimum head can be estimated using the gradually and rapidly varied flow equations. The design of zero-slope channels is also discussed. (Casey-Arizona) W72-12370

IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center. For primary bibliographic entry see Field 02E. W72-12371

04. WATER QUANTITY MANAGEMENT AND CONTROL.

4A. Control of Water on the Surface

HYDROLOGY OF SWELLING SOILS. Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 03C. STUDY OF HYDRAULIC FILTER LEVEL OFF-SET (HYFLO) EQUIPMENT FOR AUTOMATIC DOWNSTREAM CONTROL OF CANALS,

Bureau of Reclamation, Denver, Color. J. C. Schuster, and E. A. Serfozo.

Bureau of Reclamation Report REC-ERC-72-3, Jan 1972. 15 p, 13 fig, 2 tab, 3 ref.

Descriptors: *Control, *Automatic control, *Canals, Water levels, Downstream, Automation, Irrigation canals, Water level fluctuations, Hydraulics, Laboratory tests, Control systems, Analog computers, Simulation, Gates, Test results, Mathematical models, Control equipment,

Identifiers: *Equipment design, Schematic diagrams, Corning Canal (Calif), Central Valley Project, Liquid level gages, Damping, Timing circuits,

The Hydraulic Filter Level Offset (HyFLO) system for automatic downstream control of canals was mathematically modeled, designed, and constructed by the University of California, Berkeley, and the Bureau of Reclamation Office, Sacramento, Calif. The HyFLO system is a feed-back control method for automatically adjusting the canal inflow from water level offsets caused by the canal outflow. Mechanical and electrical problems occurred in a field trial of the system, and the equipment was sent to the Engineering and Research Center, Denver, Colo, for testing and evaluating. The HyFLO equipment was installed evaluating. The HyPLO equipment was instance in the laboratory to simulate one section of canal between 2 radial gates. After some equipment modification, the laboratory model satisfactorily simulated mathematical predictions of gate open-ing and water level changes in the canal section. Upon completion of the laboratory testing, the equipment was installed on one section of the Corning Canal near Red Bluff, Calif. The equipment is now controlling the flow satisfactorily. W72-11785

PARTNERSHIP IN COMPREHENSIVE RIVER BASIN PLANNING.

Water Resources Council, Washington, D.C. H. P. Caulfield, Jr.

Journal of the American Water Works Association, Vol 59, No 10, p 1217-1222, October 1967.

Descriptors: *Planning, *River basin develop-ment, *Water resources development, *Project ment, *Water resources development, *Project planning, *Water Resources Planning Act, Federal government, State government, Local govern-ment, River basin commissions, Water policy, Competing uses. Identifiers: Comprehensive Planning, Local agen-

cies planning.

The need for a partnership among federal, state and local levels of water resources planning and operations is emphasized. The federal role in encouraging the partnership, especially under the Water Resources Planning Act of 1965, is described. Six explicit reasons for comprehensive described. Six explicit reasons for comprehensive planning are given. The special needs and roles of local agencies are explored. The need for much improved methods of including local agencies in the federal-state partnership requires the help of the water utility industry. (Flack-AWWARF)

QUANTITATIVE ANALYSIS OF RESERVOIR

QUANITIATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS, Illinois State Water Survey, Urbana. H. F. Smith, J. B. Stall, and J. H. Dawes. Journal of the American Water Works Associa-tion, Vol 58, No 9, p 1187-1196, September 1966. 6 fig, 2 tab, 8 ref.

Descriptors: *Surface runoff, *Runoff, *Safe yield, *Hydrology, *Reservoir yield, *Reservoir sites, *Reservoir storage, *Streamflow, *Low flow, Frequency analysis, Hydrologic cycle, Average flow, Impoundments, *Illinois.

Identifiers: *Low flow frequency curves, *Extending streamflow records, Reservoir capacity, Streamflow variability

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A number of hydrologic tools are available to provide useful answers to practical hydrologic streamflow problems. Methods are cited for computing impounding reservoir yield and stream yield and for extending streamflow records. Use of such methods is illustrated for Illinois. The time variareservoir sites and their net yields have been studied for Illinois. (Flack-AWWARF) W72-11895

RADIATION AND HEAT BALANCE UNER THE CANOPY OF DRY AND FAIRLY MOIST OAK GROVES IN THE SOUTHERN FOREST-STEPPE OF THE UKRAINIAN SSR,

A. P. Fedoseev.
Lesovod Agrolesomelior Respub Mezhvedom
Temat Nauch Sb. 15 p 19-29, 1968.

Descriptors: Canopy, Clouds, Dry, Foliage, *Forests, Groves, *Heat balance, Moist, Radiation, Rainfall, Southern Steppe, Ukrainian-SSR,

Observations were carried out in a fairly moist oak grove (FMG) on a 3 deg northern slope, in a dry oak grove on a water divide (DGW) and in another dry oak grove on a 12 deg southern slope (DGS). Plantings and soil moisture reserves are described for Aug.-Sept. Daily totals are given (for days, overcast days, and as an average) of short wave radiation and its absorption by the tree cover in the second half of summer and the first half of fall; intensity of radiation absorption as a function of the foliage of arboreal stands; the dependence of radiation absorption on sun elevation; elements of heat balance in the groves and in the field at different times during the day. The radiation balance under the canopy in FMG was 1/11 that of the and in DGS-1/7. Turbulent heat exchange under the tree crown is close to zero values (FMG) or is negative (DGW and DGS). Heat expenditure on evaporation from the soil surface and on transpiration by the herbaceous cover in FMG is 1/18 that in the field: in DGW and DGS it is 1/8. On cloudy days, the differences in the structure of the heat balance under the oak canopies are evened out. Rainfall causes a noticeable rearrangement in the heat balance structure in the forest, when both radiation balance and the heat expenditure on evaporation are reduced.—Copyright 1972, Biological Abstracts, Inc.

PRINCIPLES FOR DISTINGUISHING RIPARIAN VEGETATION TYPES IN THE FLOOD-PLAIN FORESTS OF EASTERN CISCAUCASIA, O. V. Zelen'Ko.

esovedenie. 5. p 50-57, 1968. English summary. Identifiers: Trees, Acer campestre D, Aeration, Ash D, Carpinus caucasica D, Ciscaucasia, Cor-Asn D, Carpinus caucasica D, Ciscaucasia, Cor-nus D, Dogwood D, Elm D, Flooding, *Flood plains, Forests, Fraxinus excelsior D, Hedge, Hornbeam D, Maple D, Oak D, Pedunculate, Poplar D, Populus alba D, Principles, Quercus Robur D, *Riparian plants, Salix alba D, Soils, Types, USSR, Vegetation, Willow D.

A scale of resistance to flooding was composed for the most widespread tree species in floodplains of Eastern Ciscaucasia. For vegetation exposed to short flooding (SFV) the following species are characteristic: European ash (Fraxinus excelsior), Caucasian hornbeam (Carpinus caucasica), hedge maple (Acer campestre) and dogwood (Cornus). the vegetation exposed to medium-duration flooding (MFV) the presence of pedunculate oak (Quercus robur) and of elm and the lack of ash, hornbeam, hedge maple and dogwood is charac-teristic. For vegetation exposed to prolonged flooding, the presence of white willow (Salix alba)

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface-Group 4A

and of white poplar (Populus alba) is characteristic, together with the absence of species which are characteristic of SFV and MFV. The comparison of the 500 records available was carried out according to 'hygrotopes' (sites with a given moisture regime). Lists are given of plant indicators of riparian vegetation, separately for the fresh, the moist and the slightly moist 'hygrotopes.' Moisture-demanding species penetrate into the drier sites in MFV, whereas less-moisture demanding species penetrate into the wetter sites in the SFV. The comparison of soil morphology, which is closely connected with physical properties, and the vegetation types showed that the formation of riparian vegetation types depends on the mechanical composition, the stability and characteristics of texture, the compaction of the horizons, and on the stratification of the profile. On heavy soils, on soils with a weak texture, with compaction of the horizons, on soils with a stratified profile, vegetation typical of flooding of medium duration are more often formed. The negative effect of flooding on the vegetation is mainly due to the deterioration of aeration.—Copyright 1972, Biological Abstracts, Inc.

EFFECTS OF FOREST MANAGEMENT ON WATERSHEDS,
Virginia State Div. of Forestry, Charlottesville.

Virginia State Div. of Forestry, Charlottesville. For primary bibliographic entry see Field 04C. W72-11902

STATUS OF WATER RESOURCES USE, CONTROL AND PLANNING IN THE UNITED STATES,

John Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 06B. W72-11914

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 08A. W72-11949.

MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, New York.

Available from the National Technical Information Service as PB-206 391D, \$3.00 in paper copy, \$0.95 in microfiche. January 17, 1972. 9 p, 1 map.

Descriptors: *New York, *Dredging, *Channel improvement, *Environmental effects, Spoil banks, Water pollution sources, Benthic fauna, Turbidity, Benthic flora, Landfills, Aquatic life, Marine fish, Bays, Navigation, Water quality. Identifiers: *Environmental Impact Statements, *Flushing Bay (N.Y.).

The proposed project involves maintenance dredging of the existing federal project in Flushing Bay and Creek on the north shore of the Borough of Queens. New York City. Approximately 700,000 cubic yards of material will be removed during each maintenance action. There is no definite dredging schedule and dredging will be a infrequent intervals. Spoil will be deposited in approved ocean dumping grounds; however, upland disposal is permitted if a suitable site is found. Environmental impacts of the proposed action include turbidity within creek and bay waters, temporary loss of local marine life, disturbance of the marine food chain, disturbance of migratory bird refuges, lessened river traffic due to ships carrying heavier loads, and water quality impairment contributed to by spoil dumping. Adverse impacts in

clude the temporary turbidity during dredging, damage to benthic life from dredging, and water quality impairment from dredging and dumping. Alternatives include cessation of harbor maintenance and alternative disposal sites, preferably on land. (Grant-Florida) W72-11951

INFLUENCE OF FOREST DRAINING ON HYDROLOGY OF PEATLANDS (MET-SAOJITUKSEN VAIKUTUKSESTA SUON HYDROLOGIAAN).

Vesientutkimuslaitos, Vesihallitus, Helsinki (Fin-

S. E. Mustonen, and P. Seuna. Vesientutkimuslaitoksen Julkaisuja, No 2, Vesihallitus, Helsinki, 1971. 63 p, 37 fig, 17 tab, 27

Descriptors: *Hydrology, *Land management, *Drainage, *Forests, *Peat, Bogs, Soil types, Ditches, Slopes, Drainage area, Watersheds (Basins), Runoff, Meteorology, Precipitation (Atmospheric), Antecedent precipitation, Rainfall-runoff relationships, Evapotranspiration, Seasonal Weirs, Correlation analysis. Identifiers: *Finland.

Hydrological effects of forest draining were investigated in a drainage experiment carried out in 1935 at Ruokolahti in southeast Finland. The purpose of the experiment was to eliminate the effect of climatic factors on changes in runoff and to show the effects of ditching. The runoff quantities examined were annual runoff, monthly runoff, spring and summer maximum runoffs, and winter and summer 30-day minimum runoffs. Drainage increased annual mean runoff over a 9-year period (1961-69) by an average of 3.02 liter/sec/sq km or 95 mm. The increase in spring and summer maximum runoffs as a result of draining averaged 31% and 131%, respectively. The marked increase in minimum runoff values for both winter and summer was due largely to the year-round flow in ditches. (Josefson-USGS)

WATERPOWER RESOURCES OF THE USSR, For primary bibliographic entry see Field 06B. W72-12024

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CON-TROL AND CITY WATER SUPPLY RESER-VOID

North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.

North Carolina University Department of City and Regional Planning Research Report, July 1970. 9 p, 3 fig. 14 ref.

Descriptors: *Reservoir operation, *Reservoir releases, *Storms, *Flood forecasting, *Flood control, Water supply, Safe yield, Reservoir storage, Flow control, Rainfall, Weather data, Runoff.

The multiple use of a reservoir entails a balance of objectives. A balancing procedure is described which minimizes the sum of flood damages resulting from overspill of the reservoir after a severe rainstorm. Penalties are suggested for shortage caused by releasing water in anticipation of a storm which does not match up to the forecast severity. Storm forecasts at least five days in advance should permit the release of a substantial portion of the reservoir's contents by the time the storm arrives. Algorithms prescribe control rules for the timing and amount of such releases. (Woodard-USGS) W72-12030

NATURAL AREAS, For primary bibliographic entry see Field 06G. W72-12039

CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT, Robert S. Kerr Water Research Center, Ada,

For primary bibliographic entry see Field 05G. W72-12072

PLASTIC PIPELINES FOR LIVESTOCK WATER IN NORTHWEST NEBRASKA, Soil Conservation Service, Rushville, Nebr.

W. Peden.
J Range Manage. Vol 24 No 6 p 473-476. 1971. II-

Identifiers: *Stock water, Livestock, Nebraska, *Pipelines, Plastics.

Polyvinyl-chloride (PVC) pipe has provided a method of piping good water. Five hundred forty five miles of PVC pipe have been installed, or are planned, on 108 ranches watering approximately 300,000 acres of rangeland. This productive grass-land area can be grazed safely and efficiently with a stable, good quality water supply.—Copyright 1972, Biological Abstracts, Inc. W72-1282

HOW TO BUILD AND SAVE BEACHES AND DUNES, Rhode Island Univ., Kingston. Coll. of Resource

Rhode Island Univ., Kingston. Coll. of Resource Development.

Levetopfinen.
J. A. Jagschitz, and R. C. Wakefield.
Available from the National Technical Information Service as COM-72 10150, \$3.00 in paper copy, \$0.95 in microfiche. University of Rhode Island Marine Leaflet Series Number 4, Agricultural Experiment Station Bulletin 408, October 1971. 12 p, 18 ref.

Descriptors: *Conservation, *Shore protection, *Beach erosion, *Dunes, *Vegetation establishment, *Grasses, Seeding (Planting), Fertilization, Maintenance. Identifiers: *Fencing, *Beachgrass.

Protection of the ever-vulnerable sandy shoreline by beach and dune building is discussed. Building with brush and fences is illustrated, with emphasis on vegetation, primarily beachgrass. Instructions on obtaining, planting, fertilizing and maintaining beachgrass culms are given. (Ensign-PAI) W72-12092

THE RIVER BASIN MODEL: ASSESSMENT DE-PARTMENT.

Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU, \$0.75; microfiche from NTIS as PB-211 143, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 83 p, 17 fig, 4 tab, 1 append. EPA Program 16110 FRU 12/71-6.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Real property, *Taxes, *Assessments, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Land.

population, Land.
Identifiers: *Municipal government, *Governmental processes, *Public policy, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

subsystem realistically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental Sector (provides public services) and the model required by its Assessment Department, and the computer printed output are described. The local Assessment Department is given the opportunity and responsibility for determining assessed values of property within the local dynamic system. The largest percentage of the revenues raised by local governments is from the real property tax. The value of real property in the model is determined by the normal workings of supply and demand. The Assessment Department may assess land and/or developments at any rate from zero to one hundred percent of their market value. (See also W72-10307) (Bell-Cornell) W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT. Environmetrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-11, \$0.75; microfiche from NTIS as PB-211 146, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 81 p, 17 fig, 5 tab, 1 append. EPA Program 16110 FRU 12/71-11.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Zoning, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Public lands, Parks. Identifiers: *Governmental processes, *Pub policy, *Public services, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the other major subsystems, such as transportation and housing. Using a gaming format, the model is a computer assisted decision-making tool; model users provide inputs to the programs, on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, government departments in the Governmental Sector. The Governmental Sector and the model required by its Planning and Zoning Department, and the computer printed output are described. A principal function of the Governmental Sector is to provide public services, and its participants are elected and appointed public officials. The Planning and Zoning Department affects land use decisions through its power of zoning; it provides adequate parkland and public institutional land developed parkland and public institutional land (developed parkland-museums, 200s, libraries, public golf courses, etc.) for the local jurisdiction population. (See also W72-10307) (Bell-Cornell) W72-12123

THE RIVER BASIN MODEL: THE TRANSPOR-TATION SECTIOR.

Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-14, \$1.00; microfiche from NTIS as PB-211 147, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 94 p., 18 fig, 7 tab, 2 append. EPA Program 16110 FRU 12/71-14.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Transportation, *Railroads, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Public benefits.

Identifiers: *Governmental processes, *Public policy, *Public services, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the subsystem reastically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs, on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Government of Sector, The Governments. ments in the Governmental Sector. The Gov mental Sector (provides public services) and the model required by its bus and rail companies, and the computer printed output are described. The Governmental Sector establishes the amount of transit service, sets fares, and constructs rail lines and stations. Bus and rail companies provide the population in the simulated area with transportation service to be used for the trip to full-time work only; routes and modes of travel are assigned by the computer program. A social decision-maker assigns a dollar value for a time unit spent travelling to work by the people in his control. (See also W72-10307) (Bell-Cornell) W72-12124

REPORT ON A SURVEY FOR DISEASES OF HYDRILLA VERTICILLATA AND OTHER AQUATIC WEEDS IN SOUTHERN INDIA,

Florida Univ., Gainsville. Water Resources Research Center. R Charudattan

Typescript, n.d., 7 p (1972). OWRR B-011-FLA

Descriptors: *Aquatic weed control, *Biocontrol, Weed control, Aquatic weeds, Water hyacinth, Pathogenic bacteria, Pathogenic fungi, Plant pathology, Florida.

Identifiers: Hydrilla verticillata, Water lettuce, Pathogens, Eichhornia spp., India, Salvinia spp.,

An investigation of the potential of plant pathogens as biological controls of aquatic weeds in Florida is considered. A preliminary search for pathogens of Hydrilla verticillata in India, near its center of origin, was undertaken, and pathogens were isolated and taken to Florida to be assessed for use as biological controls. Suggestions for a more intensive search are offered. (Svensson-Washington) W72-12247

THE LAW OF DRAINAGE.

North Dakota Univ., Grand Forks. School of Law. In: Water and Water Rights, Vol. 5, secs. 450-459, 1972. p 475-648, 721 ref.

Descriptors: *Groundwater, *Drainage practices, *Legal aspects, *Repulsion (Legal aspects), Drainage districts, Drainage systems, Natural flow, Floodwater, Legislation, Federal govern-ment, State governments, Local governments, Municipal water, Grants, Damages, Reasonable use, Legal review, Drainage programs, Drainage water, Drainage, Irrigation.

The physical setting, policy considerations, and the basic legal questions of drainage law are discussed from the viewpoint of the landowner seeking to alter drainage. Substantive rights discussed include the common enemy rule; the

natural flow rule; the reasonable use rule; drainage of groundwater, watercourses, sloughs and swamps, irrigation water, and floodwater; and drainage rights created by conduct of landowners. Remedies in relation to drainage are examined including injunctive relief in drainage cases, damages, self help, and public enforcement. The final section deals with municipal drains and drainage districts including discussion of multiple purpose districts and federal programs that might give impetus to local programs training give impetus to local programs. Extensive coverage is given to the constitutionality of drainage legislation, formation of drainage dis-tricts, eminent domain powers of drainage districts, financing of drainage district operations, and dissolution of drainage districts. Pollution problems are not discussed nor is drainage related to watershed programs, flood control, or federal reclamation law. (Grant-Florida)

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TULATIN PROJECT, OREGON (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12331

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-199 637D, \$3.00 in paper copy, \$0.95 in microfiche. May 26, 1971. 10 p, 3 illus, 1

Descriptors: *Beach erosion, *Lake Erie, *Erosion control, *Environmental effects, *Pennsylvania, Erosion, Land management, Beaches, Sands, Recreation facilities, Administrative agencies, Reefs, Economic justification, Construction materials, Federal government, Project Planning,

Identifiers: *Environmental Impact Statements, *Erie (Penn).

The proposed project would consist of constructing a 200 foot wide reef along a section of renourished beach located on the south shore of Lake Erie at Erie, Pennsylvania. Restoration of the beach will re-establish the bathing beach lost through erosive action of the lake. In addition to loss of beach, continued erosion will result in damage to a parking lot and bathhouse with resulting economic losses to nearby motels and restaurants. The project would result in no apparent adverse environmental effects. The use of coarse sand and gravel for beach fill will preclude the use of this material as concrete aggregate or for other commercial uses. Alternatives to the proposed project are no improvements, continue the present costly protection of beaches through replenish-ment by truck haul from upland sources, or pump sand from the terminal end of the peninsula. (Waldron-Florida) W72-12332

CAMERON-CREOLE WATERSHED, LOUI-SIANA (FINAL ENVIRONMENTAL IMPACT

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12334

LOANS TO BE MADE BY THE FARMERS LOANS TO BE MADE BY THE PARVIEWS
HOME ADMINISTRATION TO RURAL WATER
SYSTEM NO. 1, HOSPERS, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). armers Home Administration, Washington, D.C.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Groundwater Management—Group 4B

Available from the National Technical Informa-tion Service as PB-202 790D, \$3.00 in paper copy, \$0.95 in microfiche. September 1971. 5 p.

Descriptors: *Environmental effects, *Area redevelopment, *Water supply, *Domestic water, Water supply development, Public health, Farm units, Iowa, Administrative agencies, Rural areas, Rural Sociology, Economic impact, Non-structural alternatives, Water quality control, Loans, Water quality, Water sources.

Identifiers: *Environmental Impact Statements, *Hospers (Lova)

*Hospers (Iowa).

Insured loan funds in the amount of \$1,900,000 have been authorized for use by the Rural Water System No. 1, Hospers, Iowa, to develop a rural water system to serve over 500 rural families in O'-Brien and Sioux Counties, Iowa. The project will alleviate health hazards and promote orderly growth of certain rural areas. The development of a water system will help to maintain family farm units, stop outmigration to urban areas, and promote rural industrial opportunities in the area. promote rural industrial opportunities in the area. Construction of the project will not produce any adverse environmental effects. If the proposed water system is not developed, families could (1) use polluted water; (2) haul safe water from other sources; or (3) develop individual sources of safe water including adequate water treatment facilities, which in most cases is not economically feasible. The allocation of limited funds for this project will reduce the availability of such funds for will reduce the availability of such funds for similar projects in other areas. (Waldron-Florida) W72-12337

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla. For primary bibliographic entry see Field 08A. W72-12339

MUDDY CREEK RESERVOIR, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa For primary bibliographic entry see Field 08D. W72-12340

ROOTING CUTTINGS OF SALTBUSH (ATRIPLEX HALIMUS L.), Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy. For primary bibliographic entry see Field 03B. W72-12348

BITTERBRUSH SEEDLING ESTABLISHMENT

AS INFLUENCED BY SOIL MOISTURE AND SOIL SURFACE TEMPERATURE, Forest Service (*USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.

R.B. Ferguson.
Journal of Range Management, Vol. 25, No. 1, p
47-49, January 1972. 2 tab, 12 ref.

Descriptors: *Vegetation establishment, *Shrubs, *Environmental effects, *Soil moisture, *Slopes, Topography, Soil temperature, Vegetation effects, Mode of action, Air temperature, Range management.

Identifiers: *Seedlings.

Bitterbrush (Pursial tridentata) is one of the most valuable forage plants for use in revegetation ef-forts in the mountainous western U.S. It is known forts in the mountainous western U.S. It is known that only a very low percentage of planted seeds ultimately produces mature plants, but little is known of environmental effects on seedlings, except that seedling mortality is high. Findings are presented from several separate studies on bitterbrush seedling establishment. No evidence was found that high soil surface temperatures resulted

in seedling mortality. Much evidence indicates that soil moisture has a significant effect on the vigor and growth of the seedlings. Even though southwestern slope exposures suffer dry conditions that eliminate all but the most vigorous of the seedlings, satisfactory seedling survival can be ob-tained if special care is taken to eliminate compet-ing vegetation. Also scalps made with a bulldozer about 3 ft square are suggested. It would also be wise to utilize southeastern exposures as much as possible for seedling establishment. (Casey-Arizona) Arizona)

TOPOGRAPHIC RELATIONS OF VEGETA-TION AND SOIL IN A SOUTHEASTERN ARIZONA GRASSLAND, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center. E. F. Haase, and H. A. Schreiber. Southwestern Naturalist, Vol 16, No 3-4, p 387-401, February 18, 1972. 5 fig, 2 tab, 24 ref.

Descriptors: *Ecological distribution, *Biological communities, *Arid lands, *Surveys, *Moisture content, Climatic data, Topography, Soil stoposture, Soil types, Grasslands, Grasses, Grama grasses, Shrubs, Solar radiation, Slopes, Vegetation effects, On-site data collections, *Arizona.

Variations in plant species with aspect, slope position and edaphic factors were investigated in southeastern Arizona grasslands. The study region is near Tombstone, and the topography, soils, climate and vegetation are described. Vegetation was sampled on line intercepts in 2 soil series and 6 slope aspects (NW, N, NE, SE, S, SW). Soil samples were taken and laboratory determinations included moisture retention at 15-atm tension, nitrates, organic carbon, pH and texture. Vegetation presence data from 300 line intercepts were utilized to obtain a coefficient of interspecific association for each possible pairing of 11 species. sociation for each possible pairing of 11 species. Two communities were distinguished, the black grama (Bouteloua eriopods) found primarily on SW to SE aspects, and the Hilaria Berlangeri SW to SE aspects, and the Hilaria Berlangeri (curly mesquite) community, found primarily on NW to NE aspects. Each community could be cor-related with type, texture, pH and moisture reten-tion properties of the soils. The SW-SE aspects receive greater solar radiation, which causes drought conditions to occur earlier than on other aspects. (Casey-Arizona) W72-12364

4B. Groundwater Management

AVAILABILITY OF GROUNDWATER FOR IR-RIGATION FROM GLACIAL OUTWASH IN THE PERHAM AREA, OTTER TAIL COUNTY,

Geological Survey, Washington, D.C. H. O. Reeder.

Available from GPO, Washington, D. C. 20402, Price \$1.00. Geological Survey Water-Supply Paper 2003, 1972. 45 p, 16 fig, 3 plates, 3 tab, 20 ref.

Descriptors: *Hydrogeology, *Water yield, *Water resources development, *Minnesota, *Glacial drift, Water levels, Withdrawal, Irrigation water, Surface-groundwater relationships, Con-junctive use, Storage coefficient, Transmissivity. Identifiers: *Otter Tail County (Minn).

The Perham area of Minnesota includes about 350 The Perham area of Minnesota includes about 30 square miles of surficial deposits of glacial outwash. Transmissivity values range from nearly 0 along the perimeter of the area to more than 100,000 gallons per day per foot in the central parts of the area; storage coefficient values range from 0.1 to 0.2; and the saturated thickness of the upper outwash material ranges from nearly 0 to more than 100 feet. Most of the aquifer material is fairly well sorted and is in the particle-size range of fine to coarse sand. Wells penetrating the full thickness of the aquifer and developed to 100% efficiency can be expected to yield 1,200 gpm for 30 days and to have drawdowns of less than two-thirds the aquifer thickness in much of the area; however, well yields vary widely within short distances. The amount of streamflow leaving the area will not be depleted within the 10-year analysis period, if not more than 6 inches of water per year is used on all the irrigable land in the outwash area. If pumpage and its effects on the streams are assumed to be and its effects of the streams are assumed to be prorated proportionately along the full length of the streams within the area, then the levels of lakes along these streams generally will not be lowered appreciably. Lakes and ponds not con-nected to streams in the area are expected to be lowered considerably or to be dried up completely as pumping becomes more extensive. (Knapp-USGS) W72-11752

ELECTRICAL ANALOG ANALYSIS OF THE HYDROLOGIC SYSTEM, TUCSON BASIN, SOUTHEASTERN ARIZONA, Geological Survey, Washington, D.C. T. W. Anderson.

1. W. Anderson. Available from GPO, Washington, D. C. 20402, Price \$3.75. Geological Survey Water-Supply Paper 1939-C, 1972. 34 p, 8 fig, 6 plate, 1 tab, 16

Descriptors: "Groundwater resources, "Water resources development, "Model studies, "Projections, "Arizona, Analog models, Water wells, Aquifer characteristics, Water yield, Groundwater recharge, Hydrologic data, Withdrawal, Pumping, Transmissivity, Water level fluctuations, Water table, Hydrologic systems. Identifiers: "Tucson (Ariz).

The water supply for the Tucson basin, Arizona, is derived entirely from groundwater. The average annual pumpage for 1962-64 was about 165,000 acre-feet and was greater than the natural rate of groundwater recharge. Water-level declines of as the property of the serviced for the property of the serviced for the property of the prope much as 70 feet occurred from spring 1940 to spring 1965 as a result of the overdraft. An electrical-analog model of the hydrologic system was constructed to determine the possible future ef-fects of groundwater management schemes. Basic data required for the simulation of the hydrologic system included periodic water-level measure-ments, determinations of transmissibility, and pumpage and recharge values. The model was analyzed using steady-state and storage-depletion teheniques. The steady-state analysis indicated that 97,000 acre-feet of water was entering and that 97,000 acre-feet of water was entering and leaving the groundwater reservoir annually prior to extensive development. Model projections in-dicate a maximum water-level decline of 140 feet for the period 1940-84. (Woodard-USGS) W72-11753

A SURVEY OF THE PRINCIPLES OF METAL-LIC CORROSION AND ITS CONTROL IN SALINE WATERS, Commonwealth Scientific and Industrial Research

Organization, Garden City (Australia). Div. of Mineral Chemistry. For primary bibliographic entry see Field 03C. W72-11759

BETTER TOOLS FOR WATER RESOURCES, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering. For primary bibliographic entry see Field 03B. W72-11891

ECONOMICS OF GROUNDWATER UTILIZA-TION, L. Koenig.

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Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

Journal of the American Water Works Association, Vol 55, No 1, p 59-66, January 1963. 2 tab, 13

Descriptors: *Groundwater, *Groundwater mining, *Water sources, *Withdrawal, Groundwater basins, Overdraft, Safe yield, Aquifers, Coals,

Identifiers: *Depletion, Reserves, *Groundwater utilization, Petroleum reserves, Coal reserves.

The current rate of depletion of the groundwater reserve is so many times less than most other natural resources that it is quite safe to increase greatly the use of groundwater. The present attitude of ex-treme conservatism toward groundwater is not based on facts. Groundwater reserves at an annual depletion rate of 6.1 million acre-ft have a life of 7,800 years. Groundwater is superior to surface water in many ways and the use of this resource should be greatly expanded. (Flack-AWWARF) W72-11911

BALANCED UTILIZATION OF GROUND-WATER RESOURCES.

Layne-Western Co., Kansas City, Mo.

R. O. Joslyn.

Journal of the American Water Works Association, Vol 54, No 7, p 798-802, July 1962. 3 fig, 1

Descriptors: *Groundwater, Water resources development, Water sources, Water supply, *Water wells, *Water yield, Groundwater basins, *Groundwater recharge, Overdraft, Well spacing, Hydrogeology, Water table, Kansas, Missouri. Identifiers: *Well fields, *Pumpage rates, Water table contours, Wichita (Kansas), Columbia (Mis-

Groundwater must be used and water levels permitted to decline in order to provide storage space to receive recharge. The Wichita, Kansas and Columbia, Missouri well fields case histories are examples of how an aquifer may be developed. It has been determined that cities can obtain more water from groundwater sources by establishing a lower water level in the water-bearing formations, recharge is greatly increased and more effective utilization of the groundwater reservoir results. (Flack-AWWARF)

ARTIFICIAL RECHARGE IN THE UPPER SANTA ANA VALLEY, SOUTHERN CALIFOR-NIA.

Geological Survey, Menlo Park, Calif. J. A. Moreland.

Geological Survey Open-file Report, April 6, 1972. 51 p, 11 fig, 13 tab, 19 ref.

Descriptors: *Artificial recharge, *California, Pit recharge, Water spreading, Infiltration, Water storage, Water management (Applied), Hydrogeology, Aquifer characteristics. Identifiers: *Santa Ana Valley (Calif).

Artificial recharge has long been an integral part of water-supply management in the upper Santa Ana Valley, California. About 7,500 acres of unlined channels and 2,590 acres in 60 off-channel recharge facilities are available for water spreading. To estimate potential infiltration rates for the recharge facilities, 63 single-ring infiltrometer tests were conducted at 22 recharge facilities. Measured infiltration rates ranged from about 0.1 foot per day at Patton basin to 106 feet per day at Lynwood basin. Grain-size distribution was deter-mined on 25 soil samples collected at infiltrometer test sites. Regression analysis showed a direct relation between the logarithm of the infiltration rate and the logarithm of the 20th percentile particle diameter, corresponding to 20 percent finer on the grain-size graph. Regression analysis also showed an inverse relation between the logarithm

of the infiltration rate and the logarithm of the sorting coefficient. Slit clogging greatly affects in-filtration rates. Some clogging was observed in nearly all facilities, and significant reduction of inmated recharge rates range from less than 1 foot per day in areas underlain by older alluvium to 4 feet per day in areas underlain by coarse-grained younger alluvium. (Knapp-USGS) W72-11975 filtration rates was measured in seven basins. Esti-

DISPERSION FROM RECHARGE WELL

Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B. W72-11992

PUMPING AN ARTESIAN SOURCE FOR WATER TABLE CONTROL,
Agricultural Research Service, Mandan, N. Dak.

Soil and Water Conservation Research Div.

Soil and Water Conservation Research IJV. E. J. Doering, and L. C. Benz. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8964, p 275-287, June 1972. 8 fig. 23 ref.

Descriptors: *Drainage programs, *Pumping, *Artesian aquifers, *Water levels, *North Dakota, Aquifer testing, Hydrogeology, Water table, Leaching, Confined water, Drawdown. Identifiers: *Red River Valley (N Dak).

Pumping of an artesian aquifer in the Red River Valley of North Dakota can be used to control the water table in the overlying waterlogged and saline agricultural lands at an estimated pumping cost of \$0.34 per acre per year. Because the fine-textured overburden is more than 100 ft thick and has a very low vertical hydraulic conductivity, continuous pumping will be necessary. By reducing the artesian pressure, the upward flow of saline water will be stopped, the water table in the leaky over-burden will be reestablished at a greater depth, and salts can be leached from the root zone by precipitation. Even though the water pumped from the artesian aquifer is saline, the amount would be small enough that its discharge into the Red River of the North at low flow would not make the river water unsuitable for domestic use. (Knapp-USGS)

HYDROLOGY OF IRRIGATED LANI (GIDROLOGIYA OROSHAYEMYKH ZEMEL'). Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). For primary bibliographic entry see Field 03F.

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES, For primary bibliographic entry see Field 02F. W72-12023

WATER-TRANSMITTING PROPERTIES OF AQUIFERS ON LONG ISLAND, NEW YORK, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F. W72-12027

AN EVALUATION OF THE USE OF DRILLERS' LOGS IN LITHOLOGIC STUDIES OF THE OGALLALA FORMATION OF THE SOUTHERN

GGALLALA FORMATION OF THE SOCIAL HIGH PLAINS OF TEXAS, Geological Survey, Austin, Tex. C. A. Wilson, J. T. Smith, G. L. Thompson, and W. M. Sandeen.

Geological Survey Report, June 1972. 39 p, 16 fig,

Descriptors: *Drillers' logs, *Water wells, *Well data, *Artificial recharge, *Texas, Irrigation

water, Reviews, Evaluation, Hydrologic data, Data collections, Aquifer characteristics, Computer programs, Water storage.

Identifiers: *Texas (Southern High Plains), Ogallala Formation.

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Logs made by water-well drillers were analysed in conjunction with test-hole drilling and geophysical logging to evaluate usefulness of the driller's log in delineating areas that would be suitable for artifi-cial recharge of the Ogallala Formation of the Southern High Plains of Texas. In 1969, there were about 59,000 irrigation wells in the area. A total of 309 logs was made in 222 wells and test holes during fiscal years 1970 and 1971. The number and types of logs made in the various counties of the study area are tabulated. Other data include well dules, water-level measurements, drawdownyield measurements, pumpage inventories, well-location maps, results of aquifer tests, and waterquality analyses. The commercial driller's log is more accurate for the intervals below the water more accurate for the intervals below the water table than for those above it. Greater accuracy below the water table probably reflects closer at-tention given to the drilling and logging procedures. The base of the Ogallala Formation is usually picked where the lithology changes from sand or sand and gravel to red clay or shale, blue clay or shale, or limestone. To determine the utility of computer analysis, data from drillers' logs of wells in Briscoe, Hale, and Swisher Counties were used as input. A sample of the initial computer printout with a tabulation of the data is shown. (Woodard-USGS) W72-12031

HYDRAULIC TESTS IN HOLE UAE-1, AMCHITKA ISLAND, ALASKA, Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 02F. W72-12037

DENSITY INDUCED MIXING IN CONFINED

AQUIFERS, Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and For primary bibliographic entry see Field 05B. W72-12041

RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFIL-

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 05D. W72-12071

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS, Hawaii Univ., Honolulu. Water Resources Research Center.

F. L. Peterson, and D. R. Hargis r. L. Peterson, and D. R. Hargis. Available from the National Technical Informa-tion Service as PB-211 155, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No. 54, November 1971, 51 p, 16 fig, 3 tab, 27 ref. OWRR A-028-HI (1).

Descriptors: *Artificial recharge, *Groundwater, *Injection wells, *Storm runoff, Sewage effluents, Irrigation, Industrial wastes, *Hawaii, Aquifers, Water wells, Dissolved solids. Identifiers: *Kahului (Maui).

In 1970 the Kahului Development Company began construction of a collecting basin and four deep injection wells for the disposal of storm runoff from a residential development in Kahului, Maui. This presented a unique opportunity to evaluate the suitability of the site for artificial recharge and to study the possible effects recharge of storm runoff

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Effects on Water of Man's Non-Water Activities—Group 4C

might have on the local ground-water body, both from a water quality and a hydraulic standpoint. The results of pumping and injection tests of one completed well and one test hole indicate that the finished injection wells should be able to inject at rates in excess of 5500 gallons per minute per well if significant clogging from sediment does not occur, and if hydraulic interference between the four wells operating simultaneously is not significant. The most serious potential water quality problem may be a reduction in injection efficiency owing to possible well clogging by heavy sediment loads. The general water quality effects of injecting storm runoff into the ground-water body will be to decrease the dissolved solids concentration of the ground water in the vicinity of the wells.

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GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH, Fuhriman, Barton and Associates, Provo, Utah. For primary bibliographic entry see Field 05B. W72-12193

THE LAW OF DRAINAGE, North Dakota Univ., Grand Forks. School of Law. For primary bibliographic entry see Field 04A. W72-12304

EAST GREENACRES UNIT, PRAIRIE DIVISION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho.

For primary bibliographic entry see Field 08A. W72-12336

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, DCC

For primary bibliographic entry see Field 05G. W72-12338

WELL LOSSES DUE TO REDUCED FORMA-TION PERMEABILITY, Indiana Univ., Bloomington. Dept. of Geology.

J. Karanjac. Ground Water, Vol 10, No 4, p 42-46, July-August 1972. 2 fig, 7 ref.

Descriptors: *Water wells, *Aquifer characteristics, *Permeability, *Groundwater movement, Laminar flow, Turbulent flow, Drawdown, Water yield, Hydraulic conductivity. Identifiers: *Well loss, *Well efficiency.

Steady-state flow to a single well fully penetrating a confined isotropic aquifer is analyzed. The hydraulic conductivity of the aquifer changes exponentially from a minimum value at the well face to a constant value in the 'undamaged' aquifer. An equation is given for laminar flow well losses that equation is given for laminar flow well losses that are due to a decreased permeability in the vicinity of the well. The well loss depends upon the pattern in which permeability changes. The integral expressing the well loss may be evaluated numerically. The results are presented in a graph with nondimensional parameters and can be used for engineering evaluation of the laminar well loss. (Knapp-USGS)
W72-12377

PRACTICAL SOLUTIONS FOR PUMPING TESTS IN CARBONATE-ROCK AQUIFERS, Ohio Dept. of Natural Resources, Columbus. H. B. Eagon, Jr., and D. E. Johe. Groundwater, Vol 10, No 4, p 6-13, July-August 1072, 12 fin. 8 and 1972. 12 fig, 8 ref.

Descriptors: *Aquifer testing, *Aquifer characteristics, *Water yield, Drawdown, Permeability, Transmissivity, Storage coefficient, Hydrogeology, Data collections, Hydrologic data.

gy, Data collections, Hydrologic data.

Methods of aquifer test analysis used in consolidated-rock aquifers are evaluated. In the carbonate-rock aquifer in northwestern Ohio, 76 wells were drilled and tested. The data from each test were analyzed by the standard analytical methods. Step-test data were analyzed by three methods of which a graphical solution is preferred. Once dewatering occurs, the hydraulic response of a given well may change drastically and well-loss computations may give meaningless values. However, the analysis reveals the depth of major water-yielding zones. Step-test data can also be used to predict well yields when drawdown relationships are distorted by dewatering effects. Time-drawdown data are preferred for the determination of hydraulic properties of carbonate-rock aquifers. Data from the pumped well are valid for calculating aquifer transmissivity unless dewatering has occurred. Realistic values of transmissivity can be determined by using recovery data if distorted relationships caused by dewatering are minimized. Analysis of time-drawdown data from a fully penetrating observation well provides the most reliable values for aquifer transmissivity and storage coefficient. It is best to employ regional concepts where possible. (Knapp-USGS) W72-12382

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUNTIES, GEORGIA, 1966-70, Geological Survey, Atlanta, Ga. R. E. Krause.

Georgia Geological Survey Information Circular 45, 1972. 15 p, 7 fig, 2 tab, 9 ref.

Descriptors: "Groundwater resources, "Water wells, "Withdrawal, "Water level fluctuations, "Georgia, Pumping, Aquifer characteristics, Drawdown, Hydrogeology, Water quality, Chemical analysis, Groundwater movement, Groundwater recharge.

Identifiers: "Liberty County (Ga), "McIntosh County (Ga), "McIntosh

County (Ga).

Industrial pumping near Riceboro Ga., has lowered the groundwater level enough to cause many wells, including some at Harris Neck and Blackbeard Island National Wildlife Refuges, to stop flowing. During 1968, water levels declined more than 11 feet near the center of pumping at Riceboro, 2 feet at Blackbeard Island, and 4 feet at Harris Neck National Wildlife Refuge. About 80% to 90% of this additional decline is attributed to the industrial pumping near Riceboro, but it is subindustrial pumping near Riceboro, but it is su-perimposed on a regional water-level decline of as much as 45 feet in Liberty and McIntosh Counties caused by withdrawal of groundwater throughout the coastal area since 1880. (Woodard-USGS) W72-12384

TECHNIQUE FOR PREDICTING GROUND-WATER INFLOW TO LARGE UNDERGROUND

OPENINGS, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02F. W72-12388

4C. Effects on Water of Man's Non-Water Activities

A RAINFALL-RUNOFF SIMULATION MODEL FOR ESTIMATION OF FLOOD PEAKS FOR SMALL DRAINAGE BASINS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02A. W72-11754

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN-DOMINATED SUBARCTIC SURFACES, McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02G. W72-11885

EFFECTS OF FOREST MANAGEMENT ON WATERSHEDS, Virginia State Div. of Forestry, Charlottesville. C. J. Witter.

Journal of the American Water Works Associa-tion, Vol 57, No 4, p 448-452, April 1965. 1 fig, 2

Descriptors: *Forest management, *Water yield improvement, *Clear-cutting, *Hydrologic cycle, Water yield, Humus, Precipitation, Runoff, Trans-

piration.

Identifiers: *Commercial clear-cut, *Skid roads, *Forest cover, *Plant cover, Timber returns, Diameter limit, Extensive selection, Intensive selection, Timber cut, Litter, Fernow Experimental Forest, W. V., Coweeta Hydrologic Laborato-

Forest management is the manipulation of the physical relationships among water, plants and soil. By changing the forest cover, the litter, and the upper soil layer, the runoff and evaporation can be influenced. Studies at Fernow Experimental Forest, West Virginia for four cutting practices show that water yields increase proportionally with cutting severity. Flood control can be aided during the summer and fall by forest management. These studies indicate how forest management can at the same time, permit economical timber production, increase water yield and provide clean usable water. (Flack-AWWARF) W72-11902 W72-11902

FOREST CUTTING AND INCREASED WATER

YIELD, Forest Service (USDA), Elkins, W. Va. Elkins

Forest Service (USDA), Elkins, W. Va. Elkins Research Center. K. G. Reinhart, and G. R. Trimble, Jr. Journal of the American Water Works Associa-tion, Vol 54, No 12, p 1464-1472, December 1962. 4 fig, 5 tab, 7 ref.

Descriptors: "Water yield improvement, "Forest management, "Clear-cutting, Watershed manage-ment, Land use, Gully errosion, Erosion control Turbidity, Water quality, "West Virginia. Identifiers: Commercial clear-cut, Diameter limit, Extensive selection, Intensive selection, Fernow Experimental Forest, Forest cutting.

Research on the Fernow Experimental Forest, West Virginia, has shown that forest cutting can result in increased water yield. Increase in flow was directly related to amount of timber cut and amounted to 4.4 inches on the commercial clearcut watershed. Knowledge is not yet available to water managers to predict accurately the amount and timing of increased flow that can be expected from a given treatment. Results of this research should be used with caution until treatment effects can be predicted. (Flack-AWWARF)

SUBGRADE MOISTURE UNDER OKLAHOMA

HIGHWAYS, Oklahoma State Univ., Stillwater. School of Civil Engineering.
T. A. Haliburton, D. R. Snethen, L. K. Shaw, and

B. D. Marks, III. Transportation Engineering Journal, American Society of Civil Engineers Vol 98, No TE2, Paper 8870, p 325-339, May 1972. 6 fig, 25 ref.

Descriptors: *Expansive clays, *Foundations, *Highways, *Oklahoma, Soil mechanics, Soil moisture, Stability, Moisture content, Infiltration,

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C—Effects on Water of Man's Non-Water Activities

Data and conclusions from a 6-yr field study of subgrade moisture under existing Oklahoma highways are presented to show the effects of soil, climate, and highway design on subgrade moisture conditions. Effects of subgrade moisture condi-tions on expansive subgrade volume change and overall highway performance are also described. Subgrade moisture contents increased over a 2-yr interval from original conditions to an equilibrium value of 1.1 times to 1.3 times the subgrade plastic limit. This moisture increase caused lateral and vertical subgrade expansion, reduced subgrade soil support, and rendered the pavement system pervious to rainfall infiltration and evaporation with resulting rapid pavement deterioration. Sug-gestions are given for design of highways on ex-pansive Oklahoma subgrades. (Knapp-USGS)

MILITARY FACILITIES AND ENVIRONMEN-TAL STRESSES IN COLD REGIONS, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 05B. W72-12014

MEASUREMENT OF LATERAL EROSION AT PROPOSED RIVER CROSSING SITES OF THE

Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 02J. W72-12040

WATER QUALITY OF SOME LOGGED AND UNLOGGED CALIFORNIA STREAMS, California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.

F. R. Kopperdahl, J. W. Burns, and G. E. Smith. Administrative Report No 71-12, April 1971. 19 p,

Descriptors: *Water quality, *California, *Dissolved solids, *Turbidity, *Water temperature, Lumbering, Streams, Tidal streams, Road construction, Salmonids, Aquatic environment, Dissolved oxygen, Alkalinity, Hardness (Water), Chlorides, Phosphates, Sulfates, Nitrates, Chlorides, Phosphates, Sulfates, Nitrates, Hydrogen ion concentration, Water chemistry, Water pollution offects, Water pollution sources. Identifiers: Lumbering effects, Coastal streams, Road construction effects.

Water quality surveys of four streams which had been logged or had road construction, and two undisturbed streams were conducted in 1968 and 1969. The effects were evaluated of logging on water quality and to predict capacities of the streams to rear salmonids. No abnormal concentrations of dissolved oxygen, alkalinity, hardness, dissolved solids, phosphates, chlorides, sulfate, nitrate, tannin, lignin, or pH were detected. Car-bon dioxide was low in all streams except in South Fork Caspar Creek, in which 8 mg/l were observed during decomposition of logging debris. Turbidity ourning decomposition of logging deoris. Lurbidity was high when bulldozers were working in the stream. Alternating cut and uncut blocks on one stream, and retaining a buffer strip along another, kept temperatures low in the two streams. Temperatures increased after logging. (Katz-Washington) W72-12248

4D. Watershed Protection

EFFECTS OF CONSERVATION TECHNIQUES

For primary bibliographic entry see Field 03B. W72-11909

FOREST CUTTING AND INCREASED WATER Forest Service (USDA), Elkins, W. Va. Elkins Research Center.

For primary bibliographic entry see Field 04C. W72-11916

C--WILLIAMSBURG WATERSHED, NEW MEXICO (DRAFT EN-VIRONMENTAL IMPACT STATEMENT), Soil Conservation Service, Washington, D.C. Watershed Planning Div. For primary bibliographic entry see Field 08A. W72-11952

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 08A. W72-11958

SOIL EROSION AND EROSION CONTROL (EROZIYA POCHV I MERY BOR'BY S NEY).

Izdatel'stvo 'Kolos', Moscow, 1971, 192 p.

Descriptors: *Erosion, *Soil erosion, *Erosion control, *Agriculture, *Soil conservation, Soil management, Land management, Farm manage ment, Pasture management, Forest management, Shelterbelts, Windbreaks, Precipitation (Atmospheric), Topography, Vegetation, Soils, Slopes, Gullies, Mountains, Mudflows. Identifiers: USSR, Eroded soils, Erosion classes, Erosion effects, Erosion hazard.

This three-part monograph is concerned with soil erosion types and with the effects of atmospheric precipitation, topography, soils, vegetation, and human activity on erosional processes. A classification of eroded soils is presented together with data on the damage caused by erosion to agriculture and crop production. Agricultural, silvicultural, hydraulic-engineering, and socio-economic conservation practices are reviewed, including contour tillage, terracing, introduction of improved crop rotations, application of intermediate crops, stripcropping, fertilization, pasture improvement, and planting of shelterbelts and windbreaks. Mudflows and methods of their prevention and control are examined in connection with ero-sion of soils in mountain areas. (Josefson-USGS)

DEVICE FOR CONTROL AND PREVENTION OF COAST EROSION, Fyens Saekkekompagni A.S. (Denmark). (as-

signee). For primary bibliographic entry see Field 08C. W72-12156

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y.

For primary bibliographic entry see Field 04A. W72-12332

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 08D.

05. WATER OUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY, National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. L. Fishbein.

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Chromatographic Reviews, Vol. 15, No. 2-3, p 195-238, December 1971. 17 fig, 33 tab, 165 ref.

Descriptors: *Chemical analysis, *Pollutant identification, *Mercury, *Separation techniques, *Biological properties, Inorganic compounds, Water pollution effects, Metals, Cations, Anions, Solvents, Colorimetry, Absorption, Adsorption, Retention, Metabolism, Kinetics, Toxicity, *Chromatography, Gas chromatography, Ion exchang Chromium, Electrophoresis, Alcohols, Aluminum, Copper, Cadmium, Lead, Sulfates, Chlorides, Nitrates, Uranium, Silver, Zinc, Cobalt, Nickel, Manganese, Iron, Gold, Molybdenum, Magnesium, Potassium, Sodium, Strontium, Heavy metals, Trace elements, Biochemistry, Color reactions, Laboratory equipment, Cesium, Genetics, Proteins.

Identifiers: *Mercury compounds, Excretion, Tissues, Thin layer chromatography, Paper chromatography, Ion exchange chromatography, Column chromatography, Bismuth, Acetate, Tin, Biotransformation, Arsenic, Inorganic mercury, Bioaccumulation, Diethyl mercury, Ethylmercury, Propylmercury, Butylmercury, Amylmercury, Octylmercury, Stearylmercury, Mercuric dithizonates, Alkyl mercuric dithizonates, Indium, Rhodium, Selenium, Thallium, Thorium, Tungsten, Vanadium, Yttrium, Blood, Urine, Fece Stefi, valuatumi, Tultum, pool, valuatum, Barium, Gallium, Germanium, Lanthanum, Lithium, Palladium, Platinum, Antimony, Tellurium, Rubidium, Ruthenium, Zirconium, Biological magnification, Biological samples.

The objectives of this review are to: (1) focus on the chromatographic techniques utilized for analysis of inorganic forms of mercury in admixture with other metals and cations and from diverse biological and environmental sources, and (2) delineate major aspects of inorganic mercury compounds as to their adsorption, tissue distribution, biotransformation and transport, metabolism, retention, excretion, kinetics, and toxicity. Analytical techniques considered for the separation and identification of inorganic mercury from environmental and biological sources include salient paper, thin-layer, gas, column, and ion exchange chromatography. Biological considerations, in addition to toxicity, encompass genetic effects such as chromosome aberrations, and cytological and carcinogenic aspects of inorganic mercury and its compounds. (Mackan-Battelle)
W72-11797

MARINE ALGAE OF THE SMITHSONIAN--BREDIN EXPEDITION TO YUCATAN-1960, Michigen Univ., Ann Arbor. Dept. of Botany. W. R. Taylor.

Bulletin of Marine Science, Vol. 28, No. 1, p 34 44, March 1972, 19 ref

Descriptors: *Systematics, *Marine algae, *Cyanophyta, *Chlorophyta, Phaeophyta, Rhodophyta, Cladophora. Identifiers: *Yucatan, Lyngbya confervoides,

Lyngbya majuscula, Gomontia polyrhiza, Ulva rigida, Cladophora fuliginosa, Batophora oerstedi, Acetabularia crenulata, Valonia ventricosa, Valonia ocellata, Ernodesmis verticillata, Dic-tyosphaeria vanbosseae, Dictyosphaeria cavernosa, Cladophoropsis membranacea, Boodlea composita, Anadyomene stellata, Bryopsis pennata, Caulerpa species, Avrainvilla species, Cladocephalus luteofuscus, Udotea flabellum, Penicillus species, Halimeda species, Dilophus species, Dictyota species, Pocockiella variegata, Stypodium zonale, Padina sanctae-crucis, Sargassum filipendula, Turbinaria turbinata, Galaxaura lapidescens, Fosliella farinosa, Goniolithon strictum, Amphiroa fragilissima, Amphiroa brasiliana, Corallina cubensis, Corallina subulata, Jania capilacea, Iania adherens, Hunnea cervicornis, Hungara del personal proposal del proposal lacea, Jania adherens, Hypnea cervicornis, Hypnea musciformis, Cryptarachne planifrons, Wrangelia penicillata, Griffithsia schousboei, Ceramigelia penicillata, Griffithsia schousboei, Čeramium byssoideum, Centroceras clavulatum, Spyridia filamentosa, Spyridia aculeata, Heterosiphonia wurdemanni, Polysiphonia subtilissima, Bryothamnion triquetrum, Digenia simplex, Lophocladia trichoclados, Wrightiella tumanowiczii, Bostrychia montagnei, Herposiphonia tenella, Acanthophora muscoides, Acanthophora spicifera, Laurencia species.

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Over 80 species of marine algae that were collected by the Fourth Smithsonian-Bredin Expedition of 1960 came from the territory of Quintanna Roo on the east side of the peninsula of Yucatan, Mexico, and substanially add to the records of Mexican marine algae. The principal set of specimens has been deposited in the U. S. National Herbarium. (Holoman-Battelle) W72-11800

SIMULTANEOUS MICRODETERMINATION OF IODINE AND CHLORINE OR IODINE AND BROMINE IN ORGANIC COMPOUNDS, Air Shams Univ., Cairo (Egypt). Microanalytical

Research Labs. S. S. M. Hassan, and M. B. Elsaves.

Mikrochimica Acta, No. 1, p 115-121, 1972. 5 tab,

Descriptors: *Iodine, *Chlorine, *Bromine, *Separation techniques, *Aqueous solutions, *Or-ganic compounds, Chemical analysis, Sodium compounds, Chlorides, Bromides, Ions, Solvent

extractions.

Identifiers: *Microdetermination, Combustion, Carbon tetrachloride, Sodium nitrate, Iodate, Chemical recovery.

A simple, simultaneous micro-method for determining iodine and chlorine or iodine and bromine in organic compounds involves combustion of the organic sample in an 02-filled separatory funnel containing sodium nitrate and nitric acid. The combustion solution contains elemental iodine and chloride or bromide ions. Iodine is separated by carbon tetrachloride and oxidized with bromide water to iodate. The carbon tetrachloride and exwater to lodate. The carbon tetrachionic and ex-cess bromine are evaporated and the lodate deter-mined iodometrically. The chloride and bromide ions remaining in the aqueous combustion solution are determined mercurimetrically after the excess nitrite is removed with hydrogen peroxide. Average recoveries of 98.7, 100.7, and 100.6 percent, respectively, were obtained for iodine, chlorine, and bromine in mixtures of their organi-cally bound compounds. The microdetermination of iodine in the presence of other halogens is possible by using sodium nitrite as the absorbing agent and Leipert's method. (Mackan-Battelle) W72-11801

ANALYSIS OF LOW LEVEL TRITIUM CON-CENTRATIONS BY ELECTROLYTIC EN-RICHMENT AND LIQUID SCINTILLATION COUNTING.

International Atomic Energy Agency, Vienna

International (Austria). G. Sauzay, and W. R. Schell. Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 25-33, January 1972. 3 fig, 4 tab, 3 ref.

Descriptors: "Tritium, "Water analysis, "Electrolysis, Chemical analysis, Evaluation, Statistics, Theoretical analysis, Methodology, Distillation, Pollutant identification, Radioisotopes, Measurement, Estimating, Variability, Calibration, Equations

Identifiers: *Liquid scintillation, Scintillation counting, Enrichment, Detection limits, Sensitivi-

A method is presented for estimating the standard deviations in measurement of low-level tritium concentrations in water samples. The enrichment is performed by electrolysis in a battery of 20 cells, giving an enrichment factor of about 18, and the final samples after distillation are counted in a liquid scintillation counter. A statistical evaluation of the cell better thought that there is a significant. of the cell battery shows that there is a significant spread of the cells which is included together with the error on the distillation in an overall variance corresponding to 3 percent of the initial concentra-tion. A new liquid scintillation counter was used to compare different vials using a newly prepared scintillant cocktail Instagel. Different calibration equations were determined, and the accuracy of measurements was derived theoretically and applied to hypothetical routine measurements. From these data a proposal was made for establishing routine runs with a sensitivity limit of 5 plus or minus 1.2 TU (standard deviation) for 20 samples per week. The proposed approach was applied routinely, and the results of several runs are given. Optimization of the system, i.e., decrease of the sensitivity limit, is discussed, as well as the fitting of the calibration line to the range of measured values. (Holoman-Battelle) W72-11802

ADSORPTION-FREE MEASUREMENTS ON STREAMING RADIOACTIVE SOLUTIONS, Chalmers Univ. of Technology, Goteborg (Sweden). Div. of Nuclear Chemistry.

Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 13-15, January 1972. 2 fig. 3 ref.

Descriptors: *Solvent extractions, *Aqueous solu-tions, *Radioisotopes, *Radiochemical analysis, *Flow, Raidoactivity techniques, Equipment, Measurement, Laboratory equipment, Liquids, Zinc, Sodium compounds, Methodology, Adsorption, Flow systems.

Identifiers: Benzene, Samarium, Sodium perchlorate, Acetylacetone, AKUFVE-system, Organic solvents.

A new technique for adsorption-free measure-ments of radioactivity of flowing solutions creates a free liquid jet centered in a vertical tube whereby contact between the liquid phase and the internal well of the detection cell is avoided. The flow cells, one for each liquid phase, are connected to the I liquid circulation system of an AKUFVE apparatus, and the sample is delivered into the dectector tube through a teflon nozzle. The performance of the technique has been tested in solvent extraction studies with the extraction systems Sm-acetylacetone-1M NaClO4-C6H6 and Znacetylacetone-1M NaClO4-C6H6. Experiments were carried out with the equipment in continuous operation for more than 20 hr, with no problems arising from contamination of cell walls. Experimental results indicate a good reliability for the free-jet technique. (Mackan-Battelle) W72-11803

CHARACTERISTICS OF MILKING CENTER WASTE EFFLUENT FROM NEW YORK STATE DAIRY FARMS, Cornell Univ., Ithaca, N. Y. Dept. of Food

For primary bibliographic entry see Field 05B. W72-11805

GEOGRAPHIC DISTRIBUTION AND RELATIVE ABUNDANCE OF SALPIDAE OFF THE OREGON COAST,

Oregon State Univ., Corvallis. Dept. of Oceanog-

Journal of Fisheries Research Board of Canada, Vol. 28, No. 12, p 1831-1836, December 1971. 2 fig, 2 tab, 21 ref.

Descriptors: *Distribution patterns, Invertebrates, Marine animals, *Oregon, *Coasts, Columbia River, Sampling, Equipment, Bioindicators, Plankton nets, Trawling, Seasonal, Spatial distribution, Temporal distribution. Identifiers: *Salps, *Tunicates, *Salpa fusiformis, Iasis zonaria, Pegea confoederata, Thettys vagina, Thalia democratica, Helicosalpa virgula, Newport River, Coos Bay, Brooklings River, Pelagic animals.

Salps were collected along with other pelagic animals from selected sites off the Oregon coast from 1961-64 using a 6 ft Isaacs-Kidd midwater trawl and I-m plankton nets at monthly and bimonthly intervals. The purpose of these collections was to determine the seasonal and geographical occurrence of salps off Oregon, to relate their occurrence to environmental condition, and to determine if some species may be indicators of warmwater advection. Six species of salps were identified from 434 midwater trawl and 200 meter net samples: Helicosalpa virgula, Iasis zonaria. warmwater advection. Six species of saips were identified from 434 midwater trawl and 200 meter net samples: Helicosalpa virgula, Iasis zonaria, Salpa fusiformis, Pegea confoederata, Thalia democratica, and Thetys vagina. Relative abundance of the species varied in time and space and few distributional patterns were evident; none of the specimens were collected below 150 m. Salpa fusiformis and I. zonaria, the most common species, were found during all seasons of the year, the highest numbers usually during the summer, the upwelling season. Thalia democratica, H. virgula and T. vagina were found only during 1963, and P. confoederata was most common during 1963. This was an abnormally warm year and the presence of these species off Oregon may have been related to advection from the south or west and the lack of upwelling. (Holoman-Battelle) W72-11806 W72-11806

POLLUTION MONITORING: SOME INSTRU-MENTS AND TECHNIQUES,

P. H. Curran. Instrument Practice, Vol. 26, No. 2, p 76-78, February 1972. 3 tab.

Descriptors: *Analytical techniques, *Monitoring, Pollutant identification, Air pollution, Water pollution, *Mercury, Foods, Instrumentation, Salmon, Heavy metals.

Identifiers: Spectrophotometry, Chemical recovery, Tuna, Biological samples.

A description is presented of the most popular analytical techniques used for monitoring atmospheric pollution (infrared spectrophotometry and gas chromatography), water pollution (infrared spectrophotometry, gas chromatography, and atomic absorption spectroscopy), food pollution (gas, thin-layer and gas-liquid chromatography, ultraviolet spectroscopy, colorimetric and tion (gas, tim-ayer and gas-indud criomatog-raphy, ultraviolet spectroscopy, colorimetric and fluorimetric scanning), and mercury pollution (atomic absorption spectrophotometry and a new Hg cold vapor analyzer). No actual procedures are described in detail, but best possible detection limits are included in some instances. (Mackan-W72-11808

METALS AND OTHER ELEMENTS: DETER-MINATION OF MERCURY IN FISH BY FLAMELESS ATOMIC ABSORPTION: A COL-LABORATIVE STUDY,
Food and Drug Administration, Denver, Colo.
R. K. Munns, and D. C. Holland.

Group 5A—Identification of Pollutants

Journal of the Association of Analytical Chemists, Vol. 54, No. 1, p 202-205, 1971. 2 fig, 2 tab, 18 ref.

Descriptors: *Mercury, *Spectrophotometry, *Fish, Pollutant identification, Acids, Evaluation, Performance, Reduction (Chemical), *Heavy

metas.

Identifiers: Flameless atomic absorption spectrophotometry, *Atomic absorption spectrophotometry, Biological samples, Interlaboratory studies, Muscle, Tissue, Method evaluation, Performance evaluation, Standard methods, Sample preparation, Collaborative testing, Precision, Chemical recovery.

A collaborative study among nine laboratories has resulted in the recommendation that the flameless atomic absorption spectrophotometry method for analysis of total mercury be adopted by the Association of Official Analytical Chemists. The method used to analyze total mercury in fish is based on the measurement of volatilized mercury vapor. Fish muscle is digested with nitric-sulfuric perchloric acids and stannous chloride-hydroxvlanine is used to reduce the mercury (II), which is then volatilized at room temperature in a stream of air. The mercury vapor is measured in a gas cell by atomic absorption at 253.7 nm. Collaborative results showed an overall mercury recovery of 83.5 percent and a standard deviation of 0.066. Similar samples analyzed by the official AOAC method showed erratic results with an overall recovery of 46 percent and a range of 0 to 106 percent. (Mortland-Battelle)
W72-11810

DETERMINATION OF MERCURY IN FOOD PRODUCTS AND BIOLOGICAL FLUIDS BY AERATION AND FLAMELESS ATOMIC AB-SORPTION SPECTROPHOTOMETRY, Michigan Dept. of Agriculture, Lansing

V. A. Thorpe.

Journal of the Association of Analytical Chemists, Vol. 54, No. 1, p 206-210, 1971. 3 fig, 4 tab, 4 ref.

Descriptors: *Mercury, *Pollutant identification. Foods, Fish, Chemical analysis, Acids, Chemical reactions, Oxidation, Feeds, Milk, Poult Reduction (Chemical), Calibrations, *Aeration. Identifiers: *Biological samples, Potassium permanganate, Stannous chloride, Sulfuric acid, agents, Blood, Urine, Meat, Eggs, *Atomic absorption spectrophotometry, Precision, Sample preparation, Chemical recovery.

A modification of a method developed at the Fisheries Research Board of Canada has been used for determining mercury in fish, water, other food products, and biological fluids such as meat, tood products, and blological fluids such as meat, poultry, eggs, milk, urine, blood, and animal feeds. Samples were wet digested at 50 C with sul-furic acid, oxidized with strong potassium per-maganate solution, and reduced with stannous chloride. Flameless atomic absorption spectrophotometry was used to measure vapor, and to compare sample results with prepared standards and standard curves. Replication of analyses on different days showed good precision, and in test-ing samples spiked with known amounts of mercury results showed adequate recovery. (Mackan-Battelle) W72-11811

MICROANALYSES CHLOROHYDROCARBONS IN WASTEWATER BY THIN LAYER AND GAS CHROMATOG-

RAPHY,
Federal Water Pollution Control Administration,
Fig. of Pollution Surveillance. Cincinnati, Ohio. Div. of Pollution Surveillance. F. K. Kawahara, R. L. Moore, and R. W. Gorman. Journal of Gas Chromatography, Vol. 6, p 24-27, January 1968, 4 tab. 8 ref.

Descriptors: *Pollutant identification, *Waste water (Pollution), *Chlorinated hydrocarbon pesti-

cides, Chemical analysis, Methodology, Hep-tahlor, Aldrin, Endrin, Dieldrin, Water analysis, Separation techniques, Halogenated pesticides. Identifiers: "Thin layer chromatography, "Chlorohydrocarbons, "Electron capture gas identifiers: "Inin layer chromatography, 'Chlorohydrocarbons, "Electron capture gas chromatography, "Microcoulometric titrimetric gas chromatography, Hexachlorocyclopentadiene, Hexachlorobicycloheptadiene, Heptadiloronor-bornene, Chlordene, Isodrin, I-Hydroxychlordene, Heptachlor epoxide, Gamma chlordane, Nongelhor, Beargrapement, Besterstics, times Nonachlor, Rearrangement, Retention times, Electron capture detectors, Sample preparation, Eluates, Microanalysis, Recovery, Precision.

An analytical procedure has been developed which provides for rapid determination of 14 chlorinated hydrocarbons from water grab sample, even though two pairs of compounds with identical or similar retention times are involved. The process involves extraction and concentration of and analysis by thin layer chromatography (TLC). TLC was used to resolve the coemerging pairs, to facilitate GC analysis, and for confirmation. G recoveries were obtained in the analysis of the chlorohydrocarbon compounds which are epoxidized, hydroxylated, or hyperchlorinated. However, it was observed that the low melting or liquid chlorohydrocarbons which are more volatile exhibit more then usual losses, probably incurred during concentration operations. Relative TLC R sub f values, GC relative retention data, and per-cent recovery data are tabulated for comparison. (Mackan-Battelle) W72-11812

MONITORING INDUSTRIAL EFFLUENTS. Dow Chemical Co., Freeport, Tex. Waste Control

Dept. K. D. Ripley. Chemical Engineering, Vol 79, No 10, p 119-122, May 8, 1972. 2 fig, 2 tab, 2 ref.

Descriptors: *Monitoring, *Biological properties, *Industrial wastes, *Water quality control, *Physicochemical properties, Pollutant identification, Waste water (Pollution), Dissolved oxygen, ygen demand, Water pollution sources, Pesticides, Flow rates, Temperatures, Suspended solids, Sampling, Coliforms, Alkalinity, Hydrogen ion concentration, Metals, Nitrogen, Phosphorus, Sulfur, Salinity, Oils, Inorganic compounds, Organic

Identifiers: Data interpretation, Dissolved solids, Total organic carbon.

A guide to the general aspects of monitoring indus-trial wastes covers the following areas: (1) the general approaches to monitoring - centralized and decentralized; (2) parameters to be monitored; and (3) where and how to sample. No methodology is described but examples are given to illustrate the importance of sampling frequency, selecting the best method, and data interpretation. (Mackan-Rattelle) W72-11819

THE DETERMINATION OF ORGANIC BASES IN CARBONISATION EFFLUENTS,

Salford Univ. (England).

L. S. Bark, R. L. Cooper, and K. C. Wheatstone. Water Research, Vol 6, No 1, p 117-126, January 1972. 6 fig, 3 tab, 5 ref.

Descriptors: *Organic compounds, *Industrial wastes, *Organic wastes, *Pollutant identification, *Alkalis (Bases), Phenols, Waste water (Pollution), Aromatic compounds, Sewage effluents, Chemical wastes, Solvent extractions, Aqueous

identifiers: *Flame ionization gas chromatog-raphy, Pyridine, Quinoline, Amines, Aniline, Gas liquid chromatography, Column chromatography, Sample preparation, Detection limits.

Pyridine and quinoline bases and aromatic amines present in carbonization effluents were determined by flame ionization gas chromatography. Samples were acidified, made alkaline, extracted into diethyl ether, and injected into the gas chromatograph. Good separation and determination were achieved within 30 min using dual stainless steel columns packed with Chromosorb W (AW-DCMS) coated with 15 percent Carbowax 20M and by linear temperature-programming from 123 degrees to 185 degrees at 3 C/min. From one sample, 39 peaks were resolved, of which 33 were found to correspond to 42 organic bases analyzed under identical conditions; the remaining 6 peaks have not been positively identified. Concentrations down to 0.1 mg/l of each organic base in the original sample were determined. (Snyder-Bat-W72-11820

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STANDARD ERROR OF LC 50 AND SAMPLE

SIZE IN FISH BIOASSAYS, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research and Develop-

A. L. Jensen.

Water Research, Vol 6, No 1, p 85-89, January 1972. 1 fig, 3 ref.

Descriptors: *Fish, *Bioassay, *Reliability, *Lethal limit, Statistical methods, Theoretical analysis, Water temperature, Thermal pollution, Water pollution effects. Identifiers: *Sample size, Pimephales promelas, Standard error, Probit analysis, Accuracy, Errors,

Pimephales promelas, weighing from 1.25 to 2.50 g, was used in a study of the relationship between the relative error of the LC sub 50 and sample size in fish bioassays. An instant increase in temperature was used as the lethal agent. Six separate ex-periments were performed, two of which defined the LC sub 50 range for fathead minnows accli-mated to 6 C to be between 26 and 28 C. Separate probit analyses, using percent mortality in 12 hr, were used to determine LC sub 50 values for samples sizes ranging from 10-120 minnows. The standard error for each LC sub 50 was calculated and relative errors determined for different sample sizes. It was shown that if the mean concentration tested is near the estimated LC sub 50 and the same sample size is used at each test level, the dependence of relative error on sample size is pre-dictable. The standard error of the estimated LC sub 50 is significantly reduced as sample size is increased until the sample size reaches about 30 fish. (Snyder-Battelle) W72-11821

THE IDENTIFICATION OF PETROLEUM PRODUCTS IN THE MARINE ENVIRONMENT BY ABSORPTION SPECTROPHOTOMETRY, Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab. E. M. Levy.

Water Research, Vol 6, No 1, p 57-69, January 1972. 8 fig. 8 tab, 5 ref.

Descriptors: Oil, *Pollutant identification, Water

Descriptors: Oil, "Pollutant identification, Water pollution, "Oil wastes, Oil spills, "Spectrophotometry, Canada, Sea water, Oil pollution, Ultraviolet radiation. Identifiers: "Oil characterization, "Absorption spectrophotometry, Fingerprinting, Sable Island, Magdolen Islands, Bunker C Oil, Chedabucto Bay, Absorbance, Fuel oil, Magdalen Islands, Petrole-

Absorption spectrophotometry is shown to provide a convenient method for the identification of the source of petroleum products in the marine environment. Absorbance at 228 nm relative to that at 256 nm distinguishes different members of similar types of oils sensitively and reliably. The

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants—Group 5A

technique was applied to a variety of standard samples of common petroleum products and to en-vironmental samples taken from beaches on slands off eastern Canada. The UV absorption spectra for the fuel oils were characterized by spectra for the fuel out were characterized by strong absorption maxima at approximately 228 nm and comparatively less prominent peaks at 256 nm. The spectra for the lubricating oils indicated very weak absorption at 256 nm and no clearly defined peak at 228 nm. The ratio of the absorbances at 228 and 256 nm varied from 1.23 for the residual to 7.41 for the distillate fuel oils. No change in this ration was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the peak at 250 nm was detected for a complete of the 250 nm was detected for a complete of the 250 nm was detected for a complete of the 250 nm was detected for a complete of the 250 nm was detected for a complete of the 250 nm was detected for a complete of the 250 nm was detected for a complete of the 25 the residual to 7.41 for the distillate fuel oils. No change in this ration was detected for a sample of Bunker C oil that experienced almost a year's exposure to weathering processes. The origin of oils in the environmental samples was identified. Weathering of samples as above had not significantly altered those compounds responsible for UV absorption characteristics and the origin or source could still be identified. (Mortland-Battelle) W72-11823

CAPILLARY CELL FOR PHOSPHORIMETRY
OF ORGANIC MOLECULES IN AQUEOUS
SOLVENTS AT 77 DEGREE K,
Florida Univ., Gainesville. Dept. of Chemistry.
R. J. Lukasiewicz, P. A. Rozynes, L. B. Sanders,
and I. D. Wienfordner.

and J. D. Winefordner.

Analytical Chemistry, Vol 44, No 2, p 237-240, February 1972. 3 fig, 1 tab, 19 ref.

Descriptors: *Organic compounds, Solvents, *Aqueous solutions, Sulfur compounds, Phenols, Quartz, Chemical analysis, Application methods,

Quartz, Chemica analysis, Application methods, Laboratory equipment. Identifiers: "Phosphorimetry, "Organic molecules, "Phosphorescence, Luminescence, Nitrophenol, Sulfamethazine, Thiouraci, Methanol, Detection limits, Capillary cells, Or-ganic solvents, Sample preparation, Biological

Phosphorimetric analysis of polar organic molecules in predominately aqueous solutions at motecutes in predominately aqueous solutions at 77 K has been achieved using an open quartz capillary tube for the sample cell. Limits of detection (between 0.1 and 0.1 ng) and analytical curves (linear over a 10,000 fold concentration range) for p-nitrophenol, sulfamethazine, and 2-thiouracil were measured and found to compare favorably were measured and found to compare favorably with the best previously reported values using nonaqueous solvents and larger sample cells. The measurement of phosphorescence of molecules in biological systems (sample size required is only about 20 microliter) is now possible because of the use of a 90 percent water-10 percent methanol solvent, which has a very small phosphorescence background of the quartz capillary cells, was minimized by the use of an excitation polarizer oriented perpendicularly to the sample cell length. (Mackan-Battelle) W72-11824

EVALUATION OF THE AUXOTAB ENTERIC 1 SYSTEM FOR IDENTIFICATION OF EN-TEROBACTERIACEAE, Mayo Clinic, Rochester, Minn.; and Mayo Foun-dation, Rochester, Minn. J. A. Washington, II, P. K. W. Yu, and W. J.

Applied Microbiology, Vol 23, No 2, p 298-300, February 1972. 3 tab, 8 ref.

Descriptors: *Evaluation, *Pollutant identifica-tion, Analytical techniques, Cultures, Microbiolo-gy, Salmonella, Shigella, E. coli, 'Enteric bac-teria, Coliforms, Aerobic bacteria, Methodology, Water pollution, Pathogenic bacteria. Identifiers: *Auxotab Enteric I System, *En-terobacteriaceae, Edwardsiella tarda, Citrobacter freundii, Arizona hinshawii, Klebsiella pneu-moniae. Enterobacter aerogenes, Enterobacter

moniae, Enterobacter aerogenes, Enterobacter cloacae, Enterobacter liquefaciens, Enterobacter hafniae, Serratia marcesens, Proteus mirabilis, Proteus vulgaris, Proteus morganii, Proteus rett-

An evaluation of the accuracy and convenience of the Auxotab Enteric 1 System for identification of Enterobacteriaceae was performed with 160 bacteria. The system consists of a card with 10 capillaries are inoculated with an aqueous concentrated bacterial suspension, and the card incubated at 35 C for 3 hr in a special chamber. Identification at the species level was correct in 134 (83.8 percent) instances and at the generic level in 144 (90 percent) instances. Sixty strains failed to achieve the minimal concentration of organisms required to complete the identification process within 7 hr. The system was judged to be laborious and to present a potential hazard to those working with it. (Snyder-Battelle)

INTERFERENCES IN THE DETERMINATION OF TITANIUM, ZIRCONIUM, AND HAFNIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY, Varian Techtron Ltd., Spring Vale (Australia). V. K. Panday. Analytica Chimica Acta, Vol 57, No 1, p 31-43, November 1971. 3 fig, 13 ref.

Descriptors: "Titanium, Boron, Metals, Sodium, Potassium, Cesium, Beryllium, Magnesium, Calcium, Strontium, Copper, Cadmium, Iron, Lead, Alkali metals, Alkaline earth metals, Zinc, Nickel, Mercury, Chromium, Molybdenum, Cobalt, Manganese, Aluminum, Cations, Anions, Ammonia. Identifiers: "Zirconium, "Hafnium, "Ion interference, "Chemical interference, "Atomic absorption spectrophotometry, Absorbance, Rubidium, Barium, Silicon, Lithium, Lanthanum, Tin, Vanadium, Tungsten, Bismuth, Antimony, Tantalum, Niobium, Yttrium, Hydrochloric acid, Nitric acid, Sulfuric acid, Acetic acid, Hydrogen peroxide, Atomic absorption.

The various interferences (metallic ions, inorganic and organic acids, ammonia, hydrogen peroxide) with the absorption on titanium, zirconium, and hafnium in nitrous oxide-acetylene flames during hafnium in nitrous oxide-acetylene flames during atomic absorption spectrophotometric determinations were investigated using a Techtron AA-4 atomic absorption spectrometer with a nitrous oxide-acetylene flame. Gas flow rates were adjusted for the maximum absorption signal for each element. Solutions of titanium, zirconium, and hafnium were prepared by dissolving the metal in a few drops of hydrofluoric acid and 2 ml of nitric acid with final solutions containing 0.1 percent of each acid. The effects of various ions and compounds appeared to be periodic in nature, with the smallest ion causing the largest effect. Absorption of titanium was increased by adding extraneous ions, except with boron; however, the absorption of zirconium and hafnium was generally depressed, except with lanthanum, silicon, tantalum, cadmium and copper, where an enhancement was observed. (Snyder-Battelle)

FLOC-FORMING BACTERIA ISOLATED FROM ACTIVATED SLUDGE, Tohoku Univ., Sendai (Japan). Faculty of Agricul-ISOLATED

A. Kato, K. Izaki, and H. Takahashi. Journal of General and Applied Microbiology, Vol 17, No 6, p 439-456, December, 1971. 10 fig, 7 tab,

Descriptors: *Sewage bacteria, *Flocculation, *Activated sludge, *Pollutant identification, Corynebacterium, Enzymes, Electron microscopy, Colorimetry, Pseudomonas, Organic compounds, Aerobic bacteria, Water pollution

sources.

Identifiers: Corynebacterium fascians, Bacillus cereus, Zoogloea, Flavobacterium dormitator, Infrared spectroscopy, Cellulase, Protease, Pectinase, Defloculation, Sample preparation, Biochemical tests, Culture media, Enzymatic inhibitors, Exocellular polymer.

Microorganisms isolated from phenol-adapted activated sludge were identified and characterized as to their floc-forming ability. Bacteria were isolated by plating-out dilutions of sludge extract, and identified by a series of biochemical tests. Floc formation by a bacterium was determined by the unaided eye or microscopically from samples which had been shaken for 150 hours at 37 C. The flocs were described as a capsular matrix of extracellular fibrils surrounding the cells, and were susceptible to deflocculation by cellulase, pectinase, or protease. This suggested that flocs were exopolymer compounds of cellulose, pectin, or protein. Further analysis, however, showed that the cellulose-type floc did not consist of a homopolymer of cellulose but of 9 heteropolymer of glucose and an unknown carbohydrate. The cellulase-susceptible floc-former was identified as Bacillus cereus, and the protease-susceptible microorganism as Flavobacterium dormitator. Corynebacterium fascians was identified as a new floc-former. (Long-Battelle)

SOME OBSERVATIONS ON THE TOLERANCE OF OCEANIC PLANKTON TO HIGH HYDRO-STATIC PRESSURE, Aberdeen Univ., (Scotland). Dept. of Physiology. A. G. Macdonald, I. Gilchrist, and J. M. Teal. Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 1, p 213-223, February 1972. 5 fig, 4 tab, 21 ref.

Descriptors: *Crustaceans, *Hydrostatic pressure, *Resistance, *Zooplankton, Marine animals, Amphipoda, Copepods, Respiration, Oceans, Distribution patterns, Stress, Deep water, *High pressure, Shallow water. Identifiers: Macroinvertebrates, Ostracods, Decapods, Euphausiids, Vertical distribution, Gigantocypris mulleri, Conchoecia hyalophyllum, Conchoecia macrocheira, Conchoecia rhynchena, Parathemisto, Megacalanus longicornis, Euaugaptilus magna, Pareuchaeta gracilis, Pleuromamma robusta, Euphausia krohni, Acanthephyra pelagica, Amalopeus elegans, Anomalocera patersoni.

The effect of varied hydrostatic presssures (up to 500 atm) upon the activity of certain planktonic animals was studied by researchers on the R. R. S. 'John Murray' in August 1970 and May 1971. Plankton hauls were made with an open 2-m net paid out on a maximum of 4500 m of wire. The colected animals were kept cold and experimented on within 12 hr. In the standard pressure experiment the animals were confined in a small perspex vessel mounted inside the pressure vessel and held at a selected temperature for 1 hr, after which the pressure was raised to 500 atm in 1 min, held for 15 min and then released to 1 atm over a further 1 min at a selected temperature for 1 hr, after which the pressure was raised to 500 atm in 1 min, held for 15 min and then released to 1 atm over a further 1 min period. After decompression the animals were observed for an hour in the vessel and their recovery assessed. The temperature, regulated by a water jacket around the pressure vessel, was selected to correspond to 3 depths in the sea: 13 C for shallow water; 7-8 C for 1200-1400 m; 3-2.5 C for depths greater than 2700 m. After each experiment the animals were fixed and identified. Respiration of Gigantocypris and Systellaspis debilis was measured at 250 and 500 atm for periods of 20 min at each pressure. Respiration decreased with increased pressure in Gigantocypris, and in S. debilis, respiration increased with pressure increases and vice versa. That Gigantocypris proved more pressure tolerant than the other ostracods and Anomalocera more sensitive than other copepods was consistent with normal vertical distributions. Moderate pressures generally increased locomotor activity with the exception of deeper water forms, notably Gigantocypris. (Mackan-Battelle)

THE PRODUCTION OF SURFACE-ACTIVE MATERIAL BY MARINE PHYTOPLANKTON CULTURES, Galveston Marine Lab., Tex.

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Group 5A—Identification of Pollutants

For primary bibliographic entry see Field 05B. W72-11829

RAPID SEPARATION AND ESTIMATION OF GASES PRODUCED OR UTILIZED BY MICRO-

-ORGANISMS, Edinburgh Univ. (Scotland). Dept. of Microbiolo-

gy. R. A. Herbert, and A. J. Holding. Journal of Chromatographic Science, Vol 10, No 3, p 174-175, March 1972. 1 fig, 1 tab, 8 ref.

Descriptors: *Gas chromatography, *Microorganisms, *Separation techniques, *Gases, Carbon dioxide, Chemical analysis, Methane, Thermal conductivity, *Organic compounds, *Inorganic compounds, Oxygen, Nitrogen, Sediments, Nitrates, Nitrogen fixation, Fermentation, compounds, Oxygen Nitrates, Nitrogen Laboratory equipment.

Identifiers: Quantitative analysis, Ethylene, Acetylene, Nitrous oxide, Thermal conductivity detector, Detection limits, Ethane, Substrate utilization, Acetylene reduction.

A gas chromatographic system can be used to separate and quantitatively determine inorganic and simple hydrocarbon gases (O2, N2, NO/CO, CO2, N2O, CH4, C2N2, C2H4, C2H6) evolved or utilized by microorganisms. The system consists of a gas chromatograph fitted with a thermal conductivity detector which functions alternately as a reference or a sensor. A Vitatron recorder with an electronic integrator and a dual column arrange-ment (Molecular sieve 5A and Silica gel) operated at 30 C are also utilized. Tabulated minimu at 50°C are also utilized. Tabulated minimum to extensive tection limits verify that this method allows for an effective resolution of mixtures of simple hydrocarbon and inorganic gases. It also allows for rapid, accurate analyses of several gases without having to change columns. The described method have been used to require the determine the has been used to routinely determine the nitrogenous gases resulting from the microbial dis-similation of nitrate in lake sediments as well as other gases released from the sediment. It could be to monitor utilization/production of methane and ethane in microbial fermentation systems, or to determine nitrogen fixation rates by measuring ethylene formation from acetylene. (Snyder-Bat-W72-11831

KINETICS OF GROWTH ON AQUEOUS-OIL AND AQUEOUS-SOLID DISPERSED SYSTEMS, Pennsylvania Univ. Philadelphia. School of Chemical Engineering. For primary bibliographic entry see Field 05C. W72-11832

THE FLOCCULATION OF ALGAE WITH SYNTHETIC POLYMERIC FLOCCULANTS, Connecticut Univ., Hartford. School of Medicine. For primary bibliographic entry see Field 05D. W72-11833

LIQUID X-RAY DIFFRACTION TECHNIQUES FOR OVERVIEWED SAMPLES,
Ball State Univ., Muncie, Ind. Dept. of Chemistry.
R. M. Lawrence, J. R. Relford, and S. C.

Habegger.
The Review of Scientific Instruments, Vol 43, No 1, p 40-42, January 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Methodology, Radiation, Absorp-tion, Light intensity, Crystallography, *X-ray dif-fraction, Chemical analysis, Water analysis, Aqueous solutions, Irradiation, Optical properties, *Analytical techniques. Identifiers: *Overviewed samples, *Liquid x-ray

Overviewing techniques are used in achieving agreement between the forms of the relative and absolute intensity curves in liquid x-ray diffraction studies. To view the entire scattering volume of an

diffraction, Diffractometers.

irradiated sample, diffractometer slit combina-tions are selected on the basis of intensity vs sam-ple height curves. Elimination of the sample ab-sorption correction and the associated optical restrictions yields scattering patterns that have the same form as their corresponding absolute intensity curves over the entire range in scattering angle. A theta-theta diffractometer, specially con-structed for obtaining diffraction patterns of liquids, in conjunction with a solid state detector system (comprised of photomultiplier, high voltage supply, preamplifier, linear amplifier, pulse height analyzer, scales, timer, and printer) was used in these studies. Sample and room tempera-tures were maintained within one degree C. In order to obtain a diffraction pattern of a system, a minimum of 2 runs was made over the entire angular range. Sufficient counts were obtained at each angle to give a probable error of 0.6 percent or less. The intensities for any set of runs over a sam-ple differed by less than 2 percent over several degrees of scattering angle, and were corrected for polarization and background, at approximately 6 cycles/min. These overviewing techniques have been used to study the structures of more than 20 systems. A good fit of the relative intensity curve to the corresponding absolute intensity curve was achieved in each case over the entire range in S. (Mackan-Battelle) W72-11834

A SIMPLE ASSEMBLY FOR FREEZE-DRYING OF TISSUE SAMPLES, Michigan Univ., Ann Arbor. Upjohn Research Center for Clinical Pharmacology. For primary bibliographic entry see Field 07B. W72-11835

ISOLATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FROM WHITE SUCKERS (CATASTOMUS COMMERSON), Guelph Univ. (Ontario). Dept. of Microbiology. For primary bibliographic entry see Field 05C. W72-11837

POTENTIAL SOURCES OF ERROR IN THE MEASUREMENT OF LOW RATES OF PLANK-TONIC PHOTOSYNTHESIS AND EXCRETION, Southampton Univ., (England). Dept. of Oceanog-

rapny. P. J. LeBWilliams, T. Berman, and O. Holm Hansen.

Nature New Biology, Vol 236, No 64, p 91-92, March 22, 1972. 1 tab, 8 ref.

Descriptors: *Radioactivity techniques, Descriptors: "Radioactivity techniques, "Mea-surement, "Primary productivity," Phytoplankton, Carbon radioisotopes, Irradiation, Ultraviolet radiation, Photosynthesis, Sodium compounds, Seston, Filters, Organic matter, Bicarbonates, Rates, Adsorption, Chemical reactions. Identifiers: "Errors, "Excretion, C-14, Sodium bicarbonate, Radioactive impurities, Chemical in-terference Photogriddian terference, Photooxidation.

Potential sources of interference in widely used C-14 productivity or photosynthesis measuring techniques were found to involve: (1) retention of C-14-labeled sodium bicarbonate by filters; (2) passive adsorption of radioactivity by filters and/or seston; and (3) soluble and insoluble radioactive impurities in commercially available C-14-labeled sodium bicarbonate. It was recomcontained that, since washings only decrease but do not eliminate residual radioactivity on filters, the excess labeled bicarbonate be removed by fuming in HCl vapor as suggested by Steemann-Nielsen. In studies of soluble extracellular products contaminated by soluble radioactive organic material, it was shown that irradiation of the C-14-labeled bicarbonate in solution with ultraviolet light effectively photo-oxidizes the contaminant to CO2 and reduces the impurity to less than 0.0001 percent. Care must be taken to maintain the pH of the solution between 8.0 and 8.5. (Mackan-Battelle)

W72-11838

EVALUATION OF PYRITIC OXIDATION BY MOSSBAUER SPECTROMETRY, Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science. For primary bibliographic entry see Field 05B. W72-11839

ECOLOGICAL STUDIES OF MERCIERELLA ENIGMATICA FAUVEL (ANNELIDA: POLYCHAETA) IN THE BRISBANE RIVER, Oueensland Univ., Brisbane (Australia). Dept. of Zoology. nary bibliographic entry see Field 05C.

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm (Sweden). Dept.

of Environmental Hygiene.
For primary bibliographic entry see Field 05C.
W72-11842

A BASKET FOR WASHING BENTHOLOGICAL SAMPLES, Fish and Wildlife Service Ashland, Wis. For primary bibliographic entry see Field 07B. W72-11859

NATIONAL WATER DATA PROGRAM, Geological Survey, Washington, D.C. Office of Water Data Coordination. For primary bibliographic entry see Field 07A. W72-11892

A QUANTITATIVE STUDY OF FACTORS AF-FECTING ALGAL DIVISION SYNCHRONY MEASUREMENTS, Saint Louis Univ., Mo. Dept. of Biology. For primary bibliographic entry see Field 05C. W72-11920

MONITORING FOR EFFECTIVE ENVIRON-MENTAL MANAGEMENT, Battelle Memorial Inst., Columbus, Ohio. Columbus Labs. N. L. Drobny.

Preprint 1626, American Society of Civil Engineers, National Water Resources Engineering Meeting, January 24-28, 1972, Atlanta, Georgia, 28 p. 5 fig, 2 tab, 15 ref.

Descriptors: *Water quality control, *Environmental control, *Montoring, Physicochemical properties, Ecology, Mathematical studies, Statistics, perues, Ecotogy, Mainematica studies, Statistics, Aerial photography, Infrared radiation, Remote sensing, Data collections, Measurement, Data processing, Data storage and retrieval, Data trans-mission, Pollutant identification, Quality control, Water quality, Aircraft, Satellites (Artificial).

Systems for data measurement, management and utilization are discussed in reference to an effective water quality monitoring network. In treating the water quality measurement function, explicit consideration was given to three questions: (1) what parameters should be measured; (2) what what parameters should be measured; (2) what techniques or equipment should be used in collect-ing the required data; and (3) how much data should be collected. The range of physical/chemi-cal data collection alternatives were structured into three broad categories: (1) manual sample collection, (2) electronic monitoring equipment, and (3) noncontact techniques such as aerial photography and infrared sensing using airplanes or satellites. In order that environmental quality measure-ments reach decision makers in a timely and useful manner, an effective data management system was needed to provide for coordinated transmis-

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants-Group 5A

sion, processing, storage, and retrieval of the data. Environmental quality indices are now being developed to assess the success of the various pro-grams, procedures, and policies. (Byrd-Battelle) W72-11921

POLYCHLORINATED TERPHENYLS IN THE

FOLTCHIORINATED TEMPHENYLS IN THE ENVIRONMENT, Fisheries Research Board of Canada, St. An-drews, (New Brunswick). Biological Station. V. Zitko, O. Hutzinger, W. D. Jamieson, and P. M.

Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 4, p 200-201, April 1972. 1 fig, 5 ref.

Descriptors: *Gulls, *Bird eggs, *Gas chromatography, *Pollutant identification, Canada, Polychlorinated biphenyls, Water birds, Bioassay, Separation techniques, Pesticide residues, Pesticides, Absorption.

Identifiers: *Eggs, *Polychlorinated terphenyls, *Cormorants, Larus argentatus, Phalacrocorax auritus, Bay of Fundy, Aroclor 5460, Biological samples, Gas liquid chromatography, Herring gulls, Fat tissue.

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The presence of polychlorinated terphenyls (PCT) in the eggs and fatty tissue of herring gulls (Larus argentatus) from the Bay of Fundy, Canada, was determined by gas-liquid chromatography on a 6 ft by 4 mm glass column containing 3 percent OV-210 on Chromosorb WAW 60/80, and operated at 200 C. PCT residues were confirmed by chlorination with antimony pentachloride in sealed glass tubes for 4 hr at 170-180 C. The level of PCT in subcutaneous fat and eggs of herring gulls was 1.4 and 0.1 micrograms, respectively when expressed as Aroclor 5460 on wet weight basis. PCT's were not detected in eggs and fatty tissue of double not detected in eggs and fatty tissue of double crested cormorants (Phalacrocorax auritus) from the same area indicating that PCT's are not as widely distributed in the environment as polychlorinated biphenyls. (Snyder-Battelle) W72-11923

INTERFERING GLC PEAKS FROM MATERIALS AND CHEMICALS IN PESTICIDE RESIDUE ANALYSIS, Canadian Grain Commission, Winnipeg (Manitoba). Grain Research Lab.
I. Levi, and T. W. Nowicki.

Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 4, p 193-199, April 1972. 6 fig, 5 ref.

Descriptors: *Pesticide residues, *Pollutant identification, *Gas chromatography, Chemical analysis, *Chlorinated hydrocarbon pesticides, Organic pesticides, Cereal crops, Chemicals, Or-

ganic compounds. Identifiers: *Chemical interference, Electron capture gas chromatography, Sodium sulfate, Filter paper, Talcum powder, Gas liquid chromatog-raphy, Precision.

The following materials and chemicals have been found to contribute contaminants which interfere with glc-ecd analysis of cereal grains for or-ganochlorine pesticide residues: (1) anhydrous sodium sulfate analyzed reagent; (2) filter paper, unwashed and double-acid washed; (3) wash bot-tles, unitized and all glass assembly; (4) soiled (used) teflon gaskets; (5) silane-treated glass wool; (6) Blender and Omni mixers; (7) rubber gloves; and (8) talcum powder. Some suggestions offered for eliminating spurious peaks or minimizing them to an acceptable working level include (1) removing volatile organic impurities in sodium sulfate by heating at 600 C for 2 hr. or washing with a solvent system; (2) soaking filter paper in a solvent system overnight; and (3) heating glass wool at 600 C for 2 hr. (Holoman-Battelle) W72-11924

EYES BENEATH THE WAVES, Durham Univ. (England). Dept. of Botany. For primary bibliographic entry see Field 05C. W72-11925

MEASUREMENT OF MICROSAMPLES IN ATOMIC EMISSION AND ATOMIC FLUORESCENCE FLAME SPECTROMETRY, Florida Univ., Gainesville. Dept. of Chemistry. J. R. Starbeck, P. A. St. John, and J. D.

Mikrochimica Acta, No. 1, p 55-64, 1972. 4 fig, 2

Descriptors: Metals, Heavy metals, *Potassium, *Calcium, *Lead, *Cadmium, *Nickel, Chemical analysis, Sampling, Methodology, *Specanalysis, San trophotometry. Identifiers: *Atomic emission flame spectrometry,

*Atomic fluorescence flame spectrometry, Detection limits, *Microanalysis, Chemical interference, Biological samples.

A simple, rapid, and sensitive analytical technique, based upon the combination of liquid-feed sampling with a total consumption nebulizer burner, and a microsample injection system, is described for the analysis of discrete microliter described for the analysis of discrete microliter samples by atomic emission and atomic fluorescence flame spectrometry. Three elements were studied by atomic emission flame spectrometry: K 766.5 nm; Ca 422.7 nm; and Pb 405.8 nm; and three by atomic fluorescence flame spectrometry: Pb 405.8 nm; Cd 228.8 nm; and Ni 232.0 nm. The standard solutions were prepared in deionized water which also served as the liquid carrier. For each measurement, the nonochromator was adjusted to the analytical wavelength using continuous introduction of a solution of analyte to the flame. The detection limit of each element was determined by injecting constant volumes of difdetermined by injecting constant volumes of dif-ferent concentrations of the analyte using both the ferent concentrations of the analyte using both the microsampling and the conventional continuous sampling methods with the same instrumental system. Concentrational detection limits were higher than those determined by conventional methods by about 10-100 times. The atomic emission analytical curves prepared for K and Ca were linear over the respective ranges of 0-0.10 and 0-0.5 micrograms. The atomic fluorescence analytical curves for Cd and Ni were slightly curved toward the abscissa for 0-2 and 0-5 micrograms, respectively. Initial studies involving the use of the microsampling method for K and Ca analysis in blood serum indicate that no interferences result. (Mackan-Battelle)

A VERSATILE SOLVENT SYSTEM FOR THE PAPER CHROMATOGRAPHY OF INORGANIC CATIONS, Vikram Univ., Ujjain (India). School of Studies in

Varian Charles (1997) Chemistry. N. S. Poonia, V. Bhagwat, and H. S. Singh. Mikrochimica Acta, No. 1, p 36-41, 1972. 2 fig, 2

Descriptors: *Cations, *Chromatography, *Metals, Alcohols, Ions, Gold, Cobalt, Nickel, Iron, Manganese, Zinc, Chromium, Aluminum, Copper, Cadmium, Mercury, Lead, Strontium, Molybdenum, Titanium, Magnesium, Calcium, *Heavy metals, *Trace elements.

"Heavy metals, "Trace elements. Identifiers: "Paper chromatography, "Solvent system, Chloroform, Iso-amyl alcohol, Acetones, Iso-pentanol, Platinum, Silver, Palladium, Ruthenium, Rhodium, Iridium, Bismuth, Arsenic, Antimony, Tin, Thallium, Selenium, Tellurium, Tungsten, Uranium, Vanadium, Zirconium, Thorium, Cerium, Lanthanum, Gallium, Indium, Scandium, Beryllium, Barium, Yttrium, Rubeanic acid, Dithizone Potassium ferrovandia Potassium ferrovandia. dum, perynium, Bartuni, Tuttuni, Rubeanic actor, Dithizone, Potassium ferrocyanide, Potassium fer-ricyanide, Rhodizonic acid, Aluminon, Thornol, Potassium iodide, Stannous chloride, Sodium peroxide, Organic solvents, Inorganic solvents.

The paper chromatographic resolution potentiality of the solvent system chlorogorm-acetone-iso-amyl-alcohol-ll N HCl (1:1;1:0.5 v/v) for metal caamyl-alcohol-Il N HCI (1:1:1:0.5 v/v) for metal ca-tions was tested. A fine glass capillary tube was used to place about a 5-mm diameter spot at the center of a paper disc. After drying, the paper was put in the solvent for development using a wick narrow enough for feeding the solvent such that development takes about 3 hours for individual elements or 6 hours for mixtures. The paper is then removed, the solvent front marked, dried, and subjected to the appropriate detection reagent. R sub f values and reagents for both individual ele-ments and mixtures are given. The solvent system does not resolve the rare-earth, alkali, or alkaline does not resolve the rare-earth, alkali, or alkaline earth metals due to presence of lipophilic iso-amyl alcohol. (Mortland-Battelle) W72-11929

NOTE ON THE SIGNIFICANT DIFFERENCE IN GAS-LIQUID CHROMATOGRAPHIC RESPONSES TO INSECTICIDES INJECTED AT FAST AND SLOW RATES, Food and Drug Directorate, Ottawa (Ontario).

C. E. Mendoza.

Journal of Chromatographic Science, Vol. 9, No. 12, p 753-754, December 1971. 2 tab, 6 ref.

Descriptors: *Insecticides, *Chlorinated pesticides, Aldrin, *Pollutant identification, Halogenated pesticides, *Chro-

matograph.

Identifiers: *Gas liquid chromatography, *Injection rates, Dyrene, Malathion, Parathion, Electron capture detector, p p' DDT.

The effects of injection rate on the response of a gas-liquid chromatograph to insecticides was studied using three electron capture detector foils. Significantly higher responses were obtained when Dyrene, aldrin, p,p'-DDT, malathion, and parathion were injected at a slow rate than when they were injected at a fast rate. This difference may be attributable to the width of the pesticide band moving through the column since this band may stretch at a slower rate and expose more ions to the detector surface. This assumption was sup-ported by a decreased current during injection at a slow rate. Thus, injection rate is apparently a critisaow rate. I rus, injection rate is apparently a criti-cal factor in obtaining maximum efficiency of the detector. It is suggested that an automatic injector should permit a consistent injection rate and as-sure a consistent response. (Mortland-Battelle) W72-11931

A NEW COMPUTING INTEGRATOR FOR

A NEW COMPUTING INTEGRATOR I CHROMATOGRAPHY, Vidar Corp., Mountain View, Calif. For primary bibliographic entry see Field 07B. W72-11932

TRACE ELEMENTS IN SEWAGE SLUDGES, Macaulay Inst. for Soil Research, Aberdeen (Scotland).

For primary bibliographic entry see Field 05B. W72-11933

DEVICE FOR FIELD DETERMINATION OF SELECTED HEAVY METALS IN NATURAL

SELECTED HEAVY METALS IN NATURAL WATERS, Ball State Univ., Muncie, Ind. Dept. of Chemistry. D. M. Coleman, R. E. Van Atta, and L. N. Klatt. Environmental Science and Technology, Vol. 6, No. 5, p 452-455, May 1972. 3 tab, 7 ref.

Descriptors: *Heavy metals, *Water analysis, *Polarographic analysis, Lead, Cadmium, Zinc, Iron, Instrumentation, Electrodes, Electrolytes, On-site investigations, Equipment. Identifiers: Trisodium citrate, Ion selective electrodes, *Electrochemical methods.

Group 5A—Identification of Pollutants

A relatively simple and inexpensive self-contained portable device, designed as a three-electrode polarograph for in situ determination of lead, cadnium, zinc, and iron in natural waters has been developed and tested. The system uses a dropping mercury-indicating electrode, a platinum-counter electrode, and a saturated electrode. Trisodium citrate is used as the electrolyte. The calomel precise sampling method is based on the specific application and must be determined by the analyst. The analyses for these four metals may be completed in less than an hour, with results accurate to within plus or minus 0.1 ppm. Capability for application of the instrument to the determination of other metals is built-in. Among the advantages of the instrument are: the device is readily portable; it is capable of yielding analytical results in the field for some metal ions which are relatively difficult to determine by other techniques under similar conditions; it is relatively easy to operate; suitable for use by nontechnical personnel; the chemical operations required are extremely simple; and it is designed for relatively simple maintenance, requiring only occasional replacement of propane, Freon-12, and batteries. (Mortland-Battelle) W72-11934

HYDROGEN PEROXIDE CONTENT OF RIVER WATER AND A METHOD FOR DETERMINING

IT, Nauk SSSR, Moscow. Institut Biologii Akademiya Vnutrennykh Vod.

V. Ye. Sinel'nikov. Hydrobiological Journal, Vol 7, No 1, p 96-100, 1971. 2 fig, 1 tab, 12 ref. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 7, No 1, 1971.).

Descriptors: *Water chemistry, *Chemical analysis, *Analytical techniques, *Chemical reactions, Oxidation, Oxygen, Catalysts, Enzymes, Iodine, Leida. Oxogical Statement of the Computer of th Identifiers: *USSR, *Volga River, *Hydrogen peroxide, *Luminescence, *Chemiluminescence, Luminol, Oxidases, Catalases, Iodometry.

Investigations of possible application of chemiluminescence activated by luminol to detect the presence of hydrogen peroxide and other oxidizing agents in river water, and of possible use of chemiluminescence to study decomposition of organic matter in bodies of water were based on determinations of H2O2 content in water samples collected from the Volga River between Rybinsk Reservoir and Astrakhan in July 1969. Chemiluminescence exhibited by water upon addition of luminol can be used to calculate its total oxidizing activity, while changes in chemiluminescence in-tensity are an indicator of hydrogen peroxide content. Compared to the total content of oxidizing agents, including oxygen, the hydrogen peroxide concentration is very low. It is assumed that hydrogen peroxide functions as a catalyst and supplements the activity of oxidases. (Josefson-USGS) W72-12016

USE OF ATOMIC ABSORPTION SPECTROSCOPY IN THE DETERMINATION OF MICRO G/ LITER CONCENTRATIONS OF NA+, K+, CA2+, AND MG2+, Cold Regions Research and Engineering Lab.,

For primary bibliographic entry see Field 02K. W72-12025

I

ENVIRONMENTAL STUDIES OF MERCURY AND OTHER ELEMENTS IN COAL AND LAKE SEDIMENTS AS DETERMINED BY NEUTRON

ACTIVATION ANALYSIS, Illinois State Geological Survey, Urbana. E. J. Kennedy, R. R. Ruch, H. J. Gluskoter, and N.

Reprint, from Nuclear Methods in Environmental Research, Proc of American Nuclear Society Topical Meeting August 23-24, 1971, Columbia, Mo: University of Missouri, Columbia, Office of Conferences and Short Courses, p 205-215, 1971. 8 fig,

Descriptors: "Mercury, *Lake sediments, *Elements (chemical), *Chemical analysis, *Coals, Analytical techniques, Sediments, Cores, Laboratory tests, Lake Michigan, Radiochemical analy-

Radiochemical separation techniques for determining mercury in coal and fresh water sediments were developed. The procedures involve hot-tube combustion or volatilization followed by chemical entrapment. The range of mercury for coals currently being mined in Illinois is 0.04 to 0.49 ppm, with an average of 0.18 ppm. Coals from most other states fall within this range. Washability studies indicate that the mercury is primarily, but not totally, associated with the pyrite-rich fractions. Some 132 samples of southern Lake Michigan unconsolidated bottom sediments from 31 sampling stations were assayed for mercury. A base level of 0.03 to 0.06 ppm was found in the deeper portions of the cores, whereas up to 0.38 ppm was detected in the top sediment intervals in various parts of the lake. Mercury concentrations are highest in finegrained lake bottom surficial sediments off major river mouths and correlate with the organic carbon and total sulfur concentrations of the samples. These results are consistent with data for other elements (arsenic, bromine, chromium, lead, and zinc) determined on the same samples by neutron activation analysis and other techniques. (Woodard-USGS) W72-12033

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION

Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 05B. W72-12057

SUBMERSIBLE WATER QUALITY MONITOR-ING EQUIPMENT, Water Pollution Research Lab., Stevenage (En-

gland). R. Briggs, K. Melbourne, and G. Williams.

Institution of Electronic and Radio Engineers, Conference on Electronic Engineering in Ocean Technology, Proceedings No. 19, September 21-24, 1970, (Water Pollution Research Laboratory Reprint No. 609), 13 p, 7 fig, 12 ref.

Descriptors: *Water management, *Water quality, Monitoring, Temperature, Dissolved oxygen, ion concentration, Turbidity, Am-Hydrogen *Pollutant identification.

Identifiers: Suspended solids, Suspended organic matter, Oxidized nitrogen.

River management requires accurate information of river flows, water quality and climatological conditions. The WPRL has developed a si relatively inexpensive, twin channel, battery operated monitor capable of measuring water quality parameters at depths down to 25 m. Temperature, dissolved oxygen, pH, turbidity and conductivity can be measured with the sensors now available. Data are recorded in 10 bit binary form on 1/2 in magnetic tape. Future developments point to sensors for measuring suspended matter, organic matter, ammonia, and oxidized nitrogen. Alternative means of data recording and the possibility of transmission by UHF are discussed. (Goessling-Texas) W72-12058

DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE, Engineering-Science, Inc., Oakland, Calif. For primary bibliographic entry see Field 05D.

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FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTA-BLES IN SEWAGE'.

Los Angeles County, Calif. For primary bibliographic entry see Field 05D. W72-12063

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTA-

California State Water Resources Control Board. Sacramento.

For primary bibliographic entry see Field 05D. W72-12064

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological For primary bibliographic entry see Field 05B. W72-12084

CONCENTRATION AND DISTRIBUTION OF OIL POLLUTANTS IN HALIFAX HARBOUR, 10 JUNE TO 20 AUGUST 1971.

Bedford Inst., Darmouth (Nova Scotia). Marine Ecology Lab. For primary bibliographic entry see Field 05B.

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS

Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 01B. W72-12099

DETERMINATION OF NITRILOTRIACETIC ACID (NTA) WITH ION-SELECTIVE ELEC-

State Univ. of New York, Buffalo. Dept. of Chemistry. G. A. Rechnitz, and N. C. Kenny.

Analytical Letters, Vol. 3, No. 10, p 509-514, 1970. 3 fig, 4 ref. EPA Project 16020 FTB.

Descriptors: *Chemical analysis, *Ion exchange, *Electrodes, Copper, Volumetric analysis, Deter-gents, Pollutant identification, Electrochemistry. Identifiers: *Nitrilotriacetic acid, *NTA.

A solid membrane copper ion selective electrode was used for the determination of NTA via comferences, of the type commonly found in detergents, were investigated.

W72-12110

MECHANISTIC STUDIES ON THE VALING. MYCIN-BASED POTASSIUM ELECTRODE, State Univ. of New York, Buffalo. Dept. of

Chemistry. E. Eyal, and G. A. Rechnitz.

Analytical Chemistry, Vol. 43, No. 8, p 1090-1093, July 1971. 2 fig, 5 tab, 15 ref. EPA Project 16020

Descriptors: *Chemical analysis, *Cation exchange, *Electrodes, Ion transport, *Potassium, Electrochemistry, Pollutant identification. Identifiers: *Valinomycin.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

The potentiometric selectivity of the valinomycin electrode is shown to arise from the relative complexing ability of valinomycin with univalent cations, so that the electrochemical selectivity ratio for cation pairs is given by the quotient of the equilibrium formation constants of the respective complexes. It is also shown, on the basis of experi-ments on 'frozen' electrodes, that the transport mechanism is of the mobile site type in which valinomycin acts as a carrier molecule or transport catalyst. W72-12111

ABSORPTION OF COPPER, ZINC, MANGANESE, BORON, COBALT AND MOLYB-DENUM, BY CROPS IN THE TSELINOGRAD REGION,

For primary W72-12112 ary bibliographic entry see Field 03F.

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ION-ELECTRODE STUDY OF THE CALCIUM-ADENOSINE TRIPHOSPHATE SYSTEM, State Univ. of New York, Buffalo. Dept. of

Chemistry. M. S. Mohan, and G. A. Rechnitz.

Journal of the American Chemical Society, Vol. 94, No. 5, p 1714-1716, March 8, 1972. 2 tab, 23 ref. EPA Project 16020 FTB.

Descriptors: Biochemistry, *Physicochemical properties, *Calcium compounds, *Ion exchange, *Electrode, Membranes, Electrochemistry, Pollu-Identifiers: Adenosine triphosphate.

Association constants of the complexes CaATP2-and Ca2ATP have been measured by direct poten-tiometry using a calcium ion selective membrane electrode. W72-12114

SULFATE ION-SELECTIVE MEMBRANE

ELECTRODE, State Univ. of New York, Buffalo. Dept. of

Chemistry, G. A. Rechnitz, G. H. Fricke, and M. S. Mohan. Analytical Chemistry, Vol. 44, No. 6, p 1098-1099, May 1972. 1 fig, 6 ref. EPA Project 16020 FTB.

Descriptors: *Chemical analysis, *Sulfates, *Ion exchange, *Electrodes, Membranes, Pollutant identification, Electrochemistry. Identifiers: Mixed crystal membrane.

A mixed-crystal membrane composed of 5 mole-percent Cu2S and equal mole fractions of Ag2S, PbS, and PbSO4 gave Nernstian response to sulfate and showed good selectivity with respect to univalent anions. (Hoover-EPA) W72-12115

ISOLATION OF LYTIC AGENTS RELATED TO

SPHAEROTILUS, Randolph-Macon Coll., Lynchburg, Va. D. J. Geason.

Available from the National Technical Informa-tion Service as PB-211 186, \$3.00 in paper copy, \$0.95 in microfiche.Mimeo, September 1970. 21 p, 4 fig. 16 ref. FWPCA 17050 DHI 09/70.

Descriptors: *Sphaerotilus, *Myxobacteria, Bacteriophage, Aquatic bacteria, Sewage, Waste water (Pollution), Aerobic bacteria, Pathogenic

bacteria, Microorganisms. Identifiers: *Bdellovibrio, *Spheroplasts, *Microcysts, *Enrichment cultures, Syris.

This study has been undertaken to isolate and identify those agents found in nature which are capable of lysing Sphaerotilus and thus abate the muisance associated with its occurance in flowing streams and raw sewage. Enrichment culture of river water or raw sewage and either a locally isolated strain or ATCC 13338 has resulted in the isolation of four bacteria capable of destroying the cells but not the sheath of Sphaerotilus. Specific bacteriophage could not be demonstrated. Bdellovibrio bacteriovorus first appeared as small motile rods causing spheroplasting and lysis of the boot. After subsequent reseases through the boot. host. After subsequent passages through the host it increased in numbers, size, and avidity or attack. it increased in numbers, size, and avidity or attack. Two other isolates were gram-negative rods which formed microcysts but not fruiting bodies, and produced non-diffusible yellow or red pigments. These have been tentatively identified as myx-obacters of the genus Sporocytophaga. The fourth isolate is also a gram-negative rod. It forms extremely mucoid colonies and is being further studied. (EPA abstract) W72-12120

SELECTIVE DETECTION OF ENTEROCOCCI IN MARINE WATERS, Connecticut Univ., Noank. Marine Research Lab.

J. D. Buck.

erican Journal of Public Health, Vol. 62, No. 3, p 419-421, March 1972. 3 tab, 11 ref.

Descriptors: *Marine microorganisms, *Pollutant identification, *Marine bacteria, *Sea water, Streptococcus, Water pollution sources, Microscopy, Turbidity, Enteric bacteria, Inhibi-

Identifiers: *Enterococci, *Selective media, Phase microscopy, Most probable number test, Culture

Selective detection of entrococci in marine waters has been accomplished by culturing representative samples on 3 types of presumptive media: AD broth, S.E. broth, and AD broth with 0.1 percent sodium azide. All positive tube cultures were examined using phase microscopy for the presence of streptococci. Apparent (turbidity and real (microscopic) most probable number (MPN) values were also obtained. Results indicated that false-positive reactions occurred frequently in azide dextrose broth and that increased azide con-tent was inhibitory to streptococci. Pfizer S.E. broth produced average MPN values similar (85 percent) to those observed in azide dextrose broth. The azide dextrose broth with 0.1 percent azide added was considered to be more selective and more expedient for the MPN determination of enterococci in the samples tested. (Byrd-Battelle) W72-12161

NUMERICAL TAXONOMY ON CORYNEFORM BACTERIA ISOLATED FROM POND-REARED SHRIMP (PENAEUS AZTECUS) AND POND WATER.

Texas A and M Univ., College Station. Dept. of Animal Science

C. Vanderzant, P. W. Judkins, R. Nickelson, and

H. A. Fitzhugh, Jr. Applied Microbiology, Vol. 23, No. 1, p 38-45, January 1972. 6 fig, 4 tab, 7 ref.

Descriptors: *Systematics, *Pathogenic bacteria, Aquatic bacteria, Numerical analysis, Soil bacteria, Biological properties, *Shrimp, Ponds, Computers, Water pollution sources, Water tempera-

puters, Water pollution sources, Water temperature, Cultures, Anaerobic bacteria, Aerobic bacteria, Shellfish, Amino acids, Water pollution effects, Turbidity, Pollutant identification, Carbohydrates, Vitamins.
Identifiers: "Corynebacteria, "Penaeus aztecus,
"Numerical taxonomy, Culture media, Substrate
utilization, Biochemical tests, Paper disc method,
Corynebacterium aquaticum, Corynebacterium
bovis, Corynebacterium equi, Corynebacterium
lilium, Corynebacterium michiganense,
Corynebacterium pseudodiphtheriticum. Corynebacterium pseudodiphtheriticum, Corynebacterium pseudotuberculosis, Corynebaccorynebacterium pseudotubercums, corynebacterium renale, Corynebacterium rubrum, Corynebacterium tritici, Corynebacterium hoffmanni, Arthrobacter Arthrobacter

Arthrobacter globiformis, Arthrobacter tu-mescens, Microbacterium flavum, Microbacteri-um lacticum, Propionibacterium arabinosum, Propionibacterium rubrum, Brevibacterium linens, Brevibacterium divaricatum.

Sixty-six bacterial test cultures were isolated from representative samples of pond-reared shrimp (Penaeus aztecus) and pond water. These grampositive, catalase-positive, non-spore forming, pleomorphic and rod-like bacteria were then compared with type cultures of the Corynebacteriaceae. Stock culture medium (SCM) was used to determine the time to maximum turbidity. teriaceae. Stock culture medium (SCM) was used to determine the time to maximum turbidity, growth at different temperatures and pH values, and sensitivity to antiibiotics (paper disc method). Vitamin assay media were used to determine vitamin requirements, and acid production from carbohydrates (1 percent) was tested in a medium which contained 0.1 percent peptone, 1.7 percent NaCl, 0.5 percent yeast extract and 0.0025 percent bromothymol blue. Cellular characteristics were determined on gram-stained cells. In addition, pond isolates were placed in two major groups based on colony pigmentation and in five subgroups based on cell morphology. Classification of the type cultures based on 66 cell and colony characters proved comparable to one based on 163 morphological, biochemical, and physiological characters; this similarity was not observed with pond isolates. With the aid of numerical analysis, pond isolates were placed into six major groups based on certain biochemical and physiological tests. Coryneform bacteria isolated from shrimp and pond water exhibited little similarity to the type cultures. (Byrd-Battelle) W72-12162

MICROBIAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS) SUBJECTED TO UL-TRAVIOLET-IRRADIATED SEAWATER, Oregon State Univ., Corvallis. Dept. of Food

Science and Technology. For primary bibliographic entry see Field 05B. W72-12164

CHEMICAL CHARACTERISTICS OF HUMIC CHEMICAL CHARACTERISTICS OF HUMIC COMPOUNDS ISOLATED FROM SOME DECOMPOSED MARINE ALGAE, Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab. For primary bibliographic entry see Field 05B. W72-12166

IODINE CONTENT IN MILK AND WATER IN WROCLAW VOIVODESHIP, Instytut Zootechniki, Krakow (Poland). For primary bibliographic entry see Field 02K. W72-12167

INHERENT ERRORS IN PERPENDICULAR AL-LOCATION OF OVERLAPPING CHROMATO-GRAPHIC PEAKS, Osaka Univ. (Japan). Dept. of Applied Chemistry. For primary bibliographic entry see Field 02K. W72-12168

A FLOUOROMETRIC METHOD FOR DETER-MINING CHLOROPHYLLS A, B, AND C, Johns Hopkins Univ., Baltimore, Md. M. E. Loftus, and J. H. Carpenter. Journal of Marine Research, Vol. 29, No. 3, p 319-338, September 15, 1971. 7 fig, 4 tab, 28 ref.

Descriptors: *Fluorometry, *Spectrophotometry, Fluorescence, Water pollution, Plant pigments, Phytoplankton, Plant physiology, Photosynthesis, Measurement, Separation techniques, Solvent extractions, Biomass, Primary productivity, tractions, Biomass, Frimary productions, Methodology.
Identifiers: *Chlorophyll a, *Chlorophyll b, *Chlorophyll c, Pheophytin a, Absorbance, Errors, Fluorometers, Pheopigments.

Group 5A—Identification of Pollutants

A fluorometric method is presented for determining chloraphylls a, b, and c. The effects of accessory carotenoids and chlorophyll derivatives on the accuracy of this method are analyzed. The chlorophylls were isolated from various plant specimens using either the chromatographic or the n-hexane-90 percent-acetone phase separation technique. The purity and concentration of the isolated chlorophylls were determined by spec-trophotometric methods. Conditional molecular fluorescence coefficients were determined by using a specially equipped Turner III fluorometer and monitoring the fluorescence through three combination Corning-glass filters. Measurements obtained with the various sensitivity settings on the fluorometer were converted to equivalent units on the most sensitive scale and the coefficients were expressed in those units. Good agreement between the results derived with this technique and those derived with the spectrophotometric method has been demonstrated in the absence of pheopigments in 90 percent-acetone extracts. An inherent error in the current fluorometric methods for the determination of chlorophyll a and pheophytin a was demonstrated, and a method for improving the estimation of pheophytin a is given. (Byrd-Battelle) W72-12169

ESTER SYNTHESIS BY ZOOGLOEA RAMIGERA 115 GROWN IN THE PRESENCE

Ohio State Univ., Columbus. Dept. of Microbiolo-

gy. For primary bibliographic entry see Field 05B. W72-12171

USEFULNESS OF CULTURES IN THE TAX-ONOMY OF BLUE-GREEN ALGAE, (BENUT-ZUNG VON KULTUREN IN DER BLAUALGEN-

TAXONOMIE), Ceskoslovenska Akademie Ved. Botanicky Ustav

For primary bibliographic entry see Field 05C. W72-12172

NEW PSEUDOMONAD METHANOL FOR GROWTH. UTILIZING

Hadassah Medical School, Jerusalem (Israel). Lab. of Applied Microbiology. Y. Chalfan, and R. I. Mateles. Applied Microbiology, Vol. 23, No. 1, p 135-140, January 1972. 2 fig, 5 tab, 17 ref.

Descriptors: *Pseudomonas, *Systematics, Cul-Descriptors: "Pseudomonas, "Systematics, Cui-tures, Electron microscopy, Alcohols, Amino acids, Temperature, Hydrogen ion concentration, Phosphates, Growth rates, Size, Proteins, Biologi-cal properties, *Pollutant identification. Identifiers: *Substrate utilization, Culture media, Pseudomonad C, Methanol, Pseudomonas aeru-

Pseudomonas fluorescens,

During studies of methanol utilization as a sole carbon source for microbial growth, a contaminant organism appeared which rapidly used the alcohol as its energy source. This new bacterium, classified as pseudomonad C, was isolated using a modified minimal salts medium agar containing methanol (MSM-M). The production of pigments, oxidation of gluconate to 2-ketoglucon gelatin liquifaction were among tests used to classify the microbe. The purpose was to identify the bacterium in order to compare it to other methanol/methane-using bacteria, to gain understanding of its nutritional requirements, and to check its suitability as a squire of sinde-cell check its suitability as a source of single-cell protein. Some of its characteristics include: (1) a growth doubling time of about 100 min at 32-37 C; (2) good growth at methanol concentrations up to 2 to good grown a mentanto concentrations up to 2 percent with cell yields of about 31 percent based on the methanol consumed; (3) sensitivity to phosphate; (4) pH-controlled cell densities; (5) a rod shape with single polar flagellum, pink color, 0.5-0.7 by 1.5-2.0 millimicrons in size; and (6) growth temperature range of 28-40 C. The amino acid pattern of the microbial protein indicated that the bacterium holds promise as a source of single-cell protein. (Mackan-Battelle)

NUMERICAL DIAGNOSTIC KEY FOR THE IDENTIFICATION OF ENTEROBACTERIACE, Florida Univ., Gainesville. Coll. of Medicine. H. Baer, and L. Washington.
Applied Microbiology, Vol. 23, No. 1, p 108-112, January 1972. 2 tab, 9 ref.

Descriptors: *Systematics, *Enteric bacteria, *Pollutant identification, Pathogenic bacteria, Aerobic bacteria, Testing, Fermentation Gases, E. coli, Shigella, Salmonella,

Biochemistry.
Identifiers: *Enterobacteriaceae, Biochemical tests, Aeromonas, Numerical taxonomy, Accura-cy, Salmonella typhi, Klebsiella ozaenae, Shigella cy, Santoliena tybin, Ricostena ozaenac, Singelia boydii, Enterobacter liquefaciens, Shigella sonnei, Shigella flexneri, Klebsiella pneumoniae, Arizona hinshawii, Edwardsiella tarda, Enterobacter hafniae, Providencia alcalifaciens, Providencia stuartii, Citrobacter freundii, Serratia marcescens, Enterobacter cloacae, Enterobacter aerogenes, Proteus mirabilis, Proteus vulgaris, Proteus morganii, Proteus rettgeri.

A numerical diagnostic key for enteric organisms is described which permits the identification of typical strains and of biochemical variants with high accuracy. Unknown strains are inoculated into a basic set of five media which permit the testing of eight biochemical reactions. The positive reactions are assigned points, and the score of a strain is added up, after which the identification of the strain is obtained from a table. In many in-stances, the final identification is obtained with this set of biochemical tests; and, in other instances, a small number of additional tests are required to distinguish between organisms giving the same score in the basic set of biochemica tests. The key permits an accurate, rapid, and economical differentiation of the typical and the more common atypical biotypes of enteric organ-isms in the clinical laboratory. (Mackan-Battelle)

ENTEROVIRUS CONCENTRATION OF CEL-

LULOSE MEMBRANES, Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology. C. Wallis, M. Henderson, and J. L. Melnick. Applied Microbiology, Vol. 23, No. 3, p 476-480, March 1972. 1 fig. 5 tab, 12 ref.

Descriptors: *Separation techniques, *Adsorption, *Retention, *Viruses, Aquatic microbiology, Biocontrol, Bioassay, Membrane processes, Water quality control, Water purification, Salts, Aluminum, Hydrogen ion concentration, Isolation, Pollutant identification.

Identifiers: *Cellulose membrane, *Enterovirus, Poliovirus, Aluminum chloride.

The in situ concentration of viruses from large volumes of water has been made possible by the use of aluminum salts for the adsorption of viruses on cellulose membranes. Five gallons of 0.05 M aluminum chloride in 0.5 M HCl were placed in a 5 gal pressure vessel and mixed by nitrogen pressure with tap water to give a final concentration of 0.5 mM aluminum chloride at a pH of 3.0. A second vessel containing poliovirus, sodium thiosulfate, and a pH indicator were diluted with water to give concentrations of 250, 2,500 and 25,000 cells/500 gal solution. Recoveries of 94, 88 and 94 percent, gal solution. Recoveries of 34, 88 and 34 percent, respectively, were achieved for 3 experiments which involved passing the 500 gallons as above across the 293 mm cellulose membrane (0.45 millimicrons pore size), followed by elution with a pH 11.5 protein free buffer and reconcentration on a 25 mm membrane. Viruses were then removed from the smaller membrane into a final eluate of 1-5 ml, which provided for convenient assay. (Mackan-Battelle) (Mackan-Ba W72-12176

UNUSUAL ORGANISM WHICH GIVES A POSI-TIVE ELEVATED TEMPERATURE TEST FOR FECAL COLIFORMS, Wyoming Univ., Laramie. Div. of Microbiology and Veterinary Medicine.

Applied Microbiology, Vol. 23, No. 1, p 172-173, January 1972. 2 tab, 5 ref.

Descriptors: *Coliforms, *Pollutant identification, *Environmental effects, *Hot springs, *Sulfur, Testing, Enteric bacteria, Sewage bacteria, Water temperature, Thermal springs, Water quality control, Cultures.

Identifiers: *Elevated temperature test, En-

terobacter aerogenes, Mutation.

The elevated-temperature test is commonly used as the basis distinguishing between fecal and non-fecal coliforms. Fecal coliforms produce gas from lactose within 24 hr at 44.5 C while non-fecal or soil coliforms do not give positive reactions (gas) under these conditions. A non-fecal organism has been found in a sulfur hot spring which gives a positive elevated-temperature test. In addition to the elevated-temperature test, all standard tests were run with the conclusion that the organism represents an intermediate coliform type. It was so found that non-fecal Enterobacter aerogenes, collected from the hot springs, gives a positive reaction to the elevated-temperature test. These data suggest some environmental effect upon the organisms causing the unusual test results. (Mackan-Battelle) W72-1217

RAPID RECOVERY OF ESCHERICHIA COLI FROM ESTUARINE WATER,

Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit. For primary bibliographic entry see Field 05B. W72-12178

CHARACTERIZATION OF INDOLE-POSITIVE

PROTEUS MIRABILIS,
Minnesota Univ., Minneapolis. Dept. of Lab.
Medicine; and Minnesota Univ., Mineapolis. Dept. of Pediatrics.

J. M. Matsen, D. J. Blazevic, J. A. Ryan, and W.

H. Ewing. Applied Microbiology, Vol 23, No 3, p 592-594, March 1972. 3 tab, 4 ref.

Descriptors: *Pathogenic bacteria, *Antibiotics (Pesticides), *Enteric bacteria, *Pollutant identification, Biological properties, Water pollution sources, Biochemistry, Laboratory tests, Aerobic bacteria, Resistance.

Identifiers: *Proteus mirabilis, Proteus vulgaris, Proteus rettgeri, Penicillin, Proteus morganii, Biochemical tests, Klebsiella, Cephalosporin, In-dole, Ornithine decarboxylase.

Thirteen indole-producing, swarming strains of Proteus were identified by additional biochemical testing to be Proteus mirabilis. These strains were characterized by 40 biochemical tests and by susceptibility testing to 11 antibiotics. All produced ornithine decarboxylase and were susceptible to members of the penicillin-cephalosporin groups of antibiotics. Indole-positive strains showed similar biochemical properties to indole-negative P. mirabilis but these strains were distinctly different from P. vulgaris. In order to distinguish P. mirabilis from P. vulgaris an indole and an ornithine decarboxylase test were per-formed. P. mirabilis showed a positive ornithine decarboxylase test while P. vulgaris was negative.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

Distinguishing between these two Proteus species has an important laboratory significance in that their sensitivity to the penicillin-cephalosporin group of antibiotics differs greatly. (Long-Battelle) W72-12179

PROCEDURE FOR ISOLATION AND ENU-MERATION OF VIBRO PARAHAEMOLYTICUS, Texas A and M Univ., College Station. Dept. of Animal Science. C. Vanderzant, and R. Nickelson.

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Applied Microbiology, Vol 23, No 1, p 26-33, January 1972, 4 tab, 15 ref.

Descriptors: *Pollutant identification, *Aerobic Descriptors: "Foutiant institutions, "Aerobic bacteria, Food processing industry, Systematics, Cultures, Enteric bacteria, Aerobic bacteria, "Isolation, Separation techniques, Methodology. Identifiers: "Vibrio parahaemolyticus, Fluorescent-antibody techniques, Pseudomonads, Culture media, Enrichment, "Enumeration.

A new procedure employing a direct plating technique, with or without prior enrichment, is described for the isolation and enumeration of described for the isolation and enumeration of Vibrio parahaemolyticus. A plating medium consisting of 2.0 percent peptone, 0.2 percent yeast extract, 1.0 percent corn starch, 7 percent NaCl, and 1.5 percent agar at pH 8.0 was used for growth purposes and TSB with 7 percent NaCl for an enrichment broth. Food homogenates, suspected as being infected, were diluted and either spread directly on plates or input and into enrichment directly on plates or inoculated into enrichment broth and then incubated at 42C for 18 hr. A loopful of the TSB tube culture was then streaked onto the direct plating medium and incubated at 42C for 24-48 hr. The resulting cultures were smooth, white to creamy, circular and amylase positive. A white to creamy, circular and amylase positive. A fluorescent-antibody technique confirmed the gram-negative, fermentative, oxidase-positive, pleomorphic rods which were sensitive to pteridine 0/129 as V, parahaemolyticus. Using this technique, a quantitative recovery of the microbe was made from inoculated oysters, clams, shrimp, squid, crab, and swordfish meat. (Mackan-Battelle) W72-12180

PRELIMINARY OBSERVATIONS ON THE UP-TAKE OF POLIOVIRUS BY WEST COAST SHORE CRABS, Notre Dame Coll., Belmont, Calif. Dept. of Biolo-

For primary bibliographic entry see Field 05B. W72-12182

USE OF AROMATIC COMPOUNDS FOR GROWTH AND ISOLATION OF ZOOGLOEA, Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and Pennsylvania State Univ., University Park. Dept. of Microbiology. For primary bibliographic entry see Field 05B. W72-12186

NOTE ON THE DISTRIBUTION OF CESIUM 137 IN THE LIGURO-PROVENCAL BASIN (NOTE SUR LA DISTRIBUTION DU CESIUM 137 DANS LE BASSIN LIGURO-PROVENCAL), Laboratoire de Chimie Nucleaire d'Orsay

For primary bibliographic entry see Field 05B. W72-12187

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC NORTHWEST RELATING TO POSSIBLE POL-

Oregon State Univ., Corvallis. Dept. of Oceanog-

For primary bibliographic entry see Field 05B. W72-12190

TRITIUM CONTAMINATION OF THE ENVIRONMENT (UBER DIE TRITIUMKON-TAMINATION DER UMWELT),
Kernforschungszentrum, Karlsruhe (West Ger-

For primary bibliographic entry see Field 07C. W72-12195

APPLICATION OF EXPERIENCE IN MONITORING RADIOACTIVE WASTES TO INDUSTRIAL WASTES (ERFAHRUNGEN MIT RADIOAKTIVEN ABWASSERN ALS MODELL FUR EINE VERBESSERUNG DER UBERWACHUNG VON INDUSTRIEABWASSERNA

Bundesgesundheiteant, Berlin (West Germany).
Institut fuer Wasser-, Bodes-, und Lufthygiene.
For primary bibliographic entry see Field 05B.
W72-12196

HAZARD POTENTIAL OF RADIOACTIVE

WASTE, Comitato Nazionale per l'Energia Nucleaire, Rome (Italy); and Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05B. W72-12199

PROBLEMS IN THE EVALUATION OF THE RADIOLOGIC RECEPTOR CAPACITY OF THE ENVIRONMENT - GENERAL METHOD OF AP-PROACH (PROBLEMES POSES PAR L'EVALUATION DE LA CAPACTE RADIOLOGIQUE LIMITE D'UN MILLEU RECEPTEUR - PRINCIPES GENERAUX D'AP-

PROCHE),
Commissariat a l'Energic Atomique, Fontenayaux-Roses (France). Centre d'Etudes Nucleatres.
For primary bibliographic entry see Field 05B.
W72-12201

RADIOECOLOGY AS AN AID TO THE GENERAL ENVIRONMENTAL POLLUTION PROBLEM,
Rijksinstituut voor de Volksgezondheid,

Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Environmental Sanita-For primary bibliographic entry see Field 05B. W72-12202

A CUMULATIVE EXPOSURE INDEX (CUEX) A CUMULATIVE EXPOSURE INDEX (CUEX) FOR ASSESSING ENVIRONMENTAL RELEASES OF RADIOACTIVITY, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05B. W72-12205

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L-INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969), Padua Univ. (Italy). Instituto di Igiene.
For primary bibliographic entry see Field 05B.

CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT, OCT. 1 TO DEC. 31, 1971; BIOLOGY AND HEALTH PHYSICS DIVISION; ENVIRONMENTAL RESEARCH BRANCH, Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs. For primary bibliographic entry see Field 05B. W72-12207

RADIONUCLIDE DISTRIBUTION IN COLUMBIA RIVER AND ADJACENT PACIFIC SHELF SEDIMENTS, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 05B.
W72-12209

NON-BIOLOGICAL UPTAKE OF ZINC-65 FROM A MARINE ALGAL NUTRIENT MEDI-

Oregon State Univ., Corvallis.

R. D. Tomlinson.

Available from NTIS, Springfield, Va. as RLO-1750-83, \$3.00 paper copy; \$0.95 microfiche. RLO-1750-83, Sept. 1970, 73 p.

Descriptors: "Assay, "Zinc, "Adsorption, "Surfaces, Laboratory equipment, "Laboratory tests, "Measurement, "Marine algae tracers, Chemical precipitation, Hydrogen ion concentration. Identifiers: Non-biological uptake.

Both qualitative and quantitative evaluation were made of the non-biological adsorption of zinc in a laboratory system designed to measure zinc uptake by a marine alga. Carrier-free 65Zn was used as a zinc radiotracer. Four general areas of investigation received special emphasis. These were: (1) the physiochemical nature of the nutrient medium precipitate, (2) adsorption of 65Zn by the nutrient medium precipitate, (3) adsorption of 65Zn by laboratory glassware, and, as a factor potentially influencing adsorption, (4) pH levels in algal culture conditions. (Houser-ORNL)

VERTICAL DISTRIBUTION OF RADIOACTIVI-TY IN THE COLUMBIA RIVER ESTUARY, Oregon State Univ., Corvallis. Oregon. For primary bibliographic entry see Field 05B. W72-12211

SEASONAL CHANGES IN PARTICLE SIZE DISTRIBUTION COMPOSITION, AND STRONTI-UM EXCHANGE CAPACITY OF PARTICU-LATE MATTER SUSPENDED IN THE COLUM-

BIA RIVER, Battell Pacific Northwest Labs., Richland. Wash. For primary bibliographic entry see Field 05B. W72-12212

HORIZONTAL AND VERTICAL DISTRIBU-TIONS OF RADIONUCLIDES IN THE NORTH PACIFIC OCEAN, Battelle Pacific Northwest Labs., Richland, Wash. For primary bibliographic entry see Field 05B. W72-12213

CONCENTRATION OF IRON-55 IN COMMER-CIAL FISH SPECIES FROM THE NORTH AT-LANTIC, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

Lab. For primary bibliographic entry see Field 05B. W72-12214

EXCESS-RADON AND TEMPERATURE PROFILES FROM THE EASTERN EQUATORIAL PACIFIC, Scripps Institution of Oceanography, La Jolla, Calif.

For primary bibliographic entry see Field 05B. W72-12215

ROTATORY-FLOW TECHNIQUE AS A MEANS OF DETECTING SUBLETHAL POISONING IN FISH POPULATIONS, Uppsala Univ. (Sweden). Inst. of Zoophysiology. P. E. Lindahl, and E. Schwanbom. OIKOS, Vol 22, p 354-357, 1971. 1 fig, 2 tab, 8 ref.

Descriptors: *Mercury, Water pollution effects, Metals, Heavy metals, Toxicity, Fish populations, Water pollution, Lakes, Fish behavior, Bioassay, Bioindicators, Analytical techniques, Methodolo-

Identifiers: *Rotatory-flow technique, *Sublethal poisoning, Sublethal effects, Roach, Leuciscus spp., Methyl mercuric hydroxide.

Group 5A-Identification of Pollutants

The rotatory-flow technique has been applied to roach (Leuciscus rutilus L.) from the mercurycontaminated Lake Ovre Hillen and from Lake Snosjon, which, as it chiefly receives spring water, is supposed to contain water that is comparatively pure. A highly significant difference in the mean critical rate of rotation (in r.p.m.) was found between the two samples of fish, which also differed with respect to the amount of methylmercury hydroxide found in their muscles. For the combined samples of fish, the critical rate of rotation showed a highly significant negative correla-tion to the amount of mercurial per unit muscle. The appearance of the same relationship for the fish from Lake Snosjon indicates that also in 'pure' natural waters the coordination of a proportion of the fish is significantly decreased by the presence of methylmercury hydroxide in their bodies. (Svensson-Washington)

A LABORATORY APPARATUS FOR MAIN-TAINING UNIFORM SUSPENSIONS OF FINE--GRAINED SEDIMENT, Johns Hopkins Univ., Baltimore, Md.

For primary bibliographic entry see Field 05C. W72-12266

DETECTION AND MEASUREMENT OF C-14 LABELLED INSECTICIDE METABOLITES IN FRESHWATER OSTRACODS USING THIN LAYER CHROMATOGRAPHY AND LIQUID SCINTILLATION SPECTROPHOTOMETRY,

South Dakota Univ., Vermillion.
J. A. Kawatski, and J. C. Schmulbach. Proceedings of the South Dakota Academy of Science, Vol 49, 1970. 6 p, 3 tab, 2 ref. OWRR A-015-SDAK (5).

Descriptors: *Aldrin. *Dieldrin. *Pesticide residues, *Chromatography, *Spectrophotometry, *Radioisotopes, *Tracers, *Tracking techniques, Pesticides, *Methodology, Crustaceans, Aquatic animals, Chlorinated hydrocarbon pesticides, Analytical techniques, Carbon radioisotopes, Water chemistry, Water analysis, Metabolism, Path of pollutants, Pesticide kinetics. Absorption.

Identifiers: *Thin layer chromatography, *Liquid scintillation spectrophotometry, Sublethal effects, Ostracods, Chlamydotheca spp., Biological accumulation, Accumulation of insecticide, Insecticide

A method which has been used successfully to rapidly detect and measure trace amounts of C-14aldrin, C-14-dieldrin, and possible C-14-metabolites of these insecticides extracted from water and small freshwater crustaceans, ostracods, is presented. This procedure provided a means of determining with relative ease, whether metabolism or alteration of insecticide had occurred. Furthermore, it allowed a rapid quantitation of separated residues with a sensitivity far in excess of that achieved by conventiona. TLC and considerably greater than that of gas-liquid chromatography. As little as 0.2 nanograms of C-14-aldrin, C-14-dieldrin, or equivalent C-14-metabolite per ostracod (ca. 0.5 mg) could be detected and measured. (Svensson-Washington) W72-12270

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 02H.

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5B. Sources of Pollution

POLLUTION STUDIES FOR INTERSTATE SANITATION COMMISSION, NEW YORK HARBOR MODEL

Army Engineer, Vicksburg, Miss. Waterways Experiment Station.

H. B. Simmons, and W. H. Bobb. Available from the National Technical Informa-tion Service as AD-733 746, \$3.00 in paper copy, \$0.95 in microfiche. Miscellaneous Paper No. 2-588, February 1963. 30 plate, 15 tab.

Descriptors: "Hydraulic models, "Path of pollutants, "Harbors, "New York, "Sewage effluents, Data collections, Hudson River, Water pollution sources, Dye releases, Streamflow, Regulated flow, Flow rates, Tracking techniques, Dye consecutations centrations.

Identifiers: *New York Harbor, Raritan River,

Data from hydrologic model studies include the dispersion characteristics of effluents discharged dispersion characteristics of efficients discharged from several of the major sewage treatment plants contributing to pollution in New York Harbor. The model is of the fixed-bed type constructed to linear scale ratios, model to prototype, of 1:000 horizontally and 1:100 vertically. Tides and tidal currents were reproduced in the model by means of a primary tide generator, located at the Lower New York Bay model limit, and by separate but synchronized, secondary, two-way flow-control devices located at the model limits of the Hudson River and Long Island Sound. The salinity of the model ocean was maintained at the same salinity as the prototype, and the freshwater discharges of the Hudson and Raritan Rivers were introduced at Hyde Park, New York, and Fieldville, New Jersey. The high discharges in the Hudson and Raritan Rivers were 24,000 and 3,530 cfs, respectively, and the low discharges were 4,500 and 665 cfs, respectively. The use of two fluorescent dyes made it possible to test the effluents from two treatment plants simultaneously. The two dyes, brilliant pink and uranine, were used because the light generated by these dyes is visible at opposite ends of the spectrum. (Woodard-USGS)

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER, Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France). A. Bonnier, and A. Korganoff.

Journal of Hydrology, Vol 16, No 1, p 39-47, May

1972, 20 ref.

Descriptors: *Saline water intrusion, *Diffusion, *Mixing, *Path of pollutants, *Mathematical studies, Diffusivity, Dispersion, Equations, Groundwater movement, Mathematical models. Identifiers: *Coastal aquifers.

Salt-water contamination of fresh groundwater is one of the major problems facing the population of coastal areas. The use of a mathematical model taking into consideration diffusion phenomena requires a knowledge of dispersion parameters which vary from one point to another in a non-homogeneous medium. A mathematical method for overcoming these difficulties is given. (Knapp-USGS) W72-11743

PERTURBATION ANALYSIS OF THE EQUA-TION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: I LINEAR PROBLEMS, Wisconsin Univ., Madison. Dept. of Soil Science. THROUGH POROUS MEDIA: I.

R. A. Wooding.

Journal of Hydrology, Vol 16, No 1, p 1-15, May 1972. 4 fig. 26 ref.

Descriptors: *Groundwater movement, *Path of pollutants, "Numerical analysis, "Ion transport, Porous media, Mixing, Diffusion, Leaching, Translocation, Ion exchange, Water chemistry, Saline water-freshwater interfaces.

The technique of matched asymptotic expansions is applied to solute transport in steady one-dimensional flow systems in porous slabs, membranes or columns, assuming linear exchange equilibrium and constant diffusivity. These special cases are studied as a preliminary to the examination of more difficult non-linear systems. The governing dimensional constants is the species of backet. dimensionless parameter is the macroscopic Peclet number. Three cases are treated to illustrate features of the perturbation technique. With a fluctuating diffusion ('back-mixing') layer at the outlet when the input concentration is a fairly slowly-varying, arbitrary function of time, the outer problem is hyperbolic and is easily solved, while the inner problem reduces to the solution of a set of ordinary differential equations. With a thicken-ing diffusion layer at a discontinuity between two fairly slowly-varying concentration functions, the solution obtained is qualitatively different from that of the nonlinear case. With the arrival of a difthat of the nonlinear case. With the arrival of a dif-fusion zone (initially a concentration step) at the outlet, the solution possesses features of a fluc-tuating and thickening diffusion layer. This is a special example with analogies to a boundary special example with analogies to a boundary layer within a boundary layer', and illustrates, in particular, a type of concentration distribution which can be encountered in classic breakthrough experiments. (Knapp-USGS) W72-11745

SALINITY AND THE HYDROLOGIC CYCLE, Flinders Univ., Bedford Park (Australia). School of Physical Sciences. For primary bibliographic entry see Field 03C. W72-11757

THE TRANSPORT OF SALT IN RIVERS AND ESTUARIES, New South Wales Univ., Kensington (Australia). Water Research Lab.

For primary bibliographic entry see Field 03C. W72-11764

NATURAL CONTAMINATION OF SNOW COVER IN THE BASIN OF THE ABRAMOVA GLACIER (O YESTESTVENNOY ZAGRYAZ-NENNOSTI SNEZHNOGO POKROVA V BAS-SEYNE LEDNIKA ABRAMOVA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent For primary bibliographic entry see Field 02C. W72-11778

A STUDY OF THE STATISTICAL DISTRIBU-TION OF CERIUM-144 IN THE ORGANS AND TISSUES OF AQUATIC ORGANISMS,

V. V. Chugunov, A. M. Podgurskii, G. A. Cherenkova, and E. N. Lyapin. Radiobiologiya. Vol. 11, No. 2, p 298-301. 1971. II-

Identifiers: Aquarium, *Aquatic life, Carassius carassius, Cerium-144, Distribution, Organisms, Organs, Salvinia P, Statistics, Tissues, *Cerium.

Under aquarium conditions, studies were made of the probable statistical patterns in the distribution of Ce144 in the organs and tissues of freshwater fish (Carassius carassius), Salvinia, a floating fern, fish (Carassius carassius), Salvinia, a floating fern, organic material, (polyvinylchloride) and the water of the aquarium. The types of functions of the distribution differ and depend on the specific biological features of the objects under study. In the case of the organs and tissues of the fish there are logarithmically normal laws of the spread of the concentration of Cel 44. In the case of Salvinia the spread of the specific activity of Ce144 conforms to the normal law of distribution. In the case of

polyvinylchloride the spread for the concentration of Ce144 approximates normal distribution (Charles distribution). The spread of the particles of this isotope in the water of the aquarium con-forms to the law of uniform density.—Copyright 1972, Biological Abstracts, Inc. W72-11794

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CHARACTERISTICS OF MILKING CENTER WASTE EFFLUENT FROM NEW YORK STATE DAIRY FARMS, Cornell Univ., Ithaca, N. Y. Dept. of Food

R. R. Zall.

Journal of Milk Food Technology, Vol. 35, No. 1, p 53-55, 1972. 1 fig, 6 tab, 3 ref.

Descriptors: *Sewage effluents, *Waste identifi-cation, *Dairy industry, *Cattle, Effluents, Farm wastes, Biochemical oxygen demand, Water pollu-tion sources, Nutrients, Nitrates, Nitrites.

Waste profile studies of milking center (milkhouse and milking parlor) wastes from twenty-four New York State dairy farms in 20 different countries were conducted to determine the characteristics and amounts of wastes. Composite samples were collected in small plastic swimming pools, and two-quart portions transported to the laboratory where biological and chemical analyses were performed. Waste volumes were physically measured at the farms. Sixty percent of the experimental sites sampled showed a sewage load of less than 10 lb. of BOD per day farm with approximately 4 gal of waste per cow per day from milking center operations. The amounts of nitrates and nitrites were no greater than the levels from sewage treatment plant effluents. Also, there were relatively small differences in soluble N and P compounds when compared with animals/farm or with pounds Waste profile studies of milking center (milkhouse when compared with animals/farm or with pounds of BOD produced in milking centers. The principal solids in the wastes were manure, feed, bedding, and hood dirt. (Snyder-Battelle) W72-11805

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN, Wisconsin Univ., Madison. Water Chemistry Lab. J. J. Delfino, and G. F. Lee. Water Research, Vol. 5, p 1207-1217, December 1971. 11 fig, 18 ref.

Descriptors: *Dissolved oxygen, *Chemical properties, *Manganese, Water quality, Pollutant identification, Sediment-water interfaces, Carbonates, *Wisconsin, Water analysis, Sampling, Iron, Aquatic life, Sediments, Hydrogen ion concentration, Depths, Sulfides, Reduction (Chemical), Alkalinity, Laboratory tests, On-site investigations, Water temperature, Physiochemical properties, Desorption.

Identifiers: *Hypolimnion, *Lake Mendota, Desorption.

Desorption.

The increase of Mn concentration and the simultaneous depletion of dissolved oxygen in the bottom waters (hypolimnion) of Lake Mendota, Wisconsin were studied in situ. In situ water samples were collected 3-4 times weekly from 21-23 m depths, 1 m above the sediment-water interface depths, 1 m above the sediment-water interface using a Van Dorn lucite sampler and analyzed for Mn, Fe, sulfide, alkalinity, and dissolved oxygen. Temperature was measured in situ and pH readings were made in the laboratory. Considerably higher Mn concentrations were found in the hypolimnion compared to Fe, despite a sedimentary Fe/Mn weight ratio of 19:1. Laboratory equilibration studies under anoxic conditions indicated that M were an important perspecter. equinoration studies under anoxic conduions in-dicated that pH was an important parameter in-volved in the release of Mn from the sediments. This was also implied by the Mn and pH data mea-sured in situ. Possible mechanisms involved in the release of Mn from the sediments, including

desorption of Mn from oxide substrates, reduction of Mn oxides, and dissolution of carbonates and sulfides, are discussed. (Mackan-Battelle) W72-11809

THE NUMBER OF SAPROPHYTIC BACTERIA AND, THE CONTENT OF ORGANIC MATTER IN THE WATER OF PONDS OF KARAMET-NIYAZ AND THE KARAKUM CANAL,

O. I. Bogdanovich.
Biol Vnutr Vod Inf Byull. 8. p 25-29. 1970.
Identifiers: *Bacteria, *Karakum Canal
*Karamet-Niyaz, *Organic matter, Ponds, USSR.

The maximum content of saprophytic bacteria were found in 8 ponds of Karamet Niyaz and the Karakum Canal at the end of spring; there was a considerable decrease in summer, with some increase again in the fall. Fluctuations in the number of saprophytic bacteria in the ponds were very great: from 45 to 77,800 cells/ml. In the Karakum great: from 45 to 77,800 cells/ml. In the Karakum Canal the number of saprophytic bacteria was low and varied from 5 to 200 cells/ml. Fertilizing the ponds with mineral and organic components sharply increased the content of saprophytic bacteria in the water. A good correlation was observed between the number of saprophytic bacteria and the permanganate oxidizability of the water. The content of organic matter and saprophytic bacteria in the water of rearing ponds increased in parallel with the increase in the measures to intensify growth in the ponds.—Copyright 1972, Biological Abstracts, Inc. W72-11814 W72-11814

MONITORING INDUSTRIAL EFFLUENTS, Dow Chemical Co., Freeport, Tex. Waste Control Dept.
For primary bibliographic entry see Field 05A.
W72-11819

THE DETERMINATION OF ORGANIC BASES IN CARBONISATION EFFLUENTS, Salford Univ. (England). For primary bibliographic entry see Field 05A. W72-11820

THE TEMPERATURE DEPENDENCY OF BIOLOGICAL DENITRIFICATION, McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering. For primary bibliographic entry see Field 05C. W72-11822

THE PRODUCTION OF SURFACE-ACTIVE MATERIAL BY MARINE PHYTOPLANKTON CULTURES, Galveston Marine Lab., Tex. W. B. Wilson, and A. Collier. Journal of Marine Research, Vol 30, No 1, p 15-26, January 15, 1972. 7 fig, 1 tab, 22 ref.

Descriptors: *Surfactants, *Phytoplankton, Foaming, Cultures, *Diatoms, Aquatic life, Pyrrophyta, Dinoflagellates, Sea water, Duration curves, Rating curves, Films, Organic compounds, *Texas, *Gulf of Mexico, Surface tension, Chrysophyta. Identifiers: Decay rate, Cyclotella nana, Cyclotella caspia, Chaetoceros galvestonensis, Glenodinium, Coccolithus huxleyi.

The production of surface-active materials (surfactants) by axenic cultures of five marine diatoms, a dinoflagellate, and a coccolithophorid (all grown in uniform culture conditions) was determined by measuring the volume and stability of the foam produced by shaking them in their culture medium. Although a diatom, Cyclotella nana, produced the most stable surfactant, and a coccolithophorid, Coccolithus huxleyi, the least stable surfactant, differences in the stability of the

surfactant between the species of diatoms employed were considerable. Cyclotella nana produced more surfactants than did Cyclotella caspia or Glenotdinium sp. where as other diatoms (Chaetoceros II and Cyclotella galvestonensis) did not. In addition, Chaetoceros I produced more stable foams than did the other Chaetoceros species. These results indicate an innate tendency to synthesize surfactants. Differences were not related to variations in cell numbers or biomass, but they may be related to innate characteristics of a particular species. Surfactants were not identified but were suspected to be lipids and/or long fatty acid chains. (Mackan-Battelle)

RELATION BETWEEN THE DEGRADATION OF DDT AND THE IRON REDOX SYSTEM IN

SOILS,
Agricultural Research Service, Beltsville, Md.
Soils Lab.; and Agricultural Research Service,
Beltsville, Md. Soil and Water Conservation
Research Div.

Journal of Agricultural and Food Chemistry, Vol 20, No 2, p 324-327, March/April 1972. 4 fig. 4 tab, 18 ref.

Descriptors: "Chemical degradation, "DDT, "Oxidation-reduction potential, "Soils, "Iron, Degradation (Decomposition), Colorimetry, DDD, Pesticide kinetics, Path of pollutants, Chemical reactions, Chemical properties, Ions, Metals, Enzymes, Submergence, Assay, Aquatic soils, Anerobic conditions, Soils chemistry, Soil analysis, "Reduction (chemical). Identifiers: Urease.

In order to test the relationship between DDT degradation and the iron redox system in soils, an experiment was conducted on soil samples collected from four agricultural areas in different regions of the U.S. Four 150g soil samples were treated with DDT (30 mg), which yielded a concentation of 200 ppm, passed through a riffle, and divided into 10-12 g subsamples in 4 oz serum bottles. These samples were then amended with aliquots of urease in solution sufficient to submerge the soils, and the waterlogged soils were incubated at 35 C from 3-28 days. Unamended water-logged soils were run simultaneously as conwater-logged soils were run simultaneously as con-trols. All redox potentials were measured on a pH meter and ferrous iron determinations made by meter and ferrous iron determinations made by colorimetric analysis on a spectrophotometer at 510 millimicrons. The rates of degradation of DDT were related to the rates of formation of ferrous iron in the amended soils. A relation was also obtained between the redox potential and the DDT degradation in the soils. With an in vitro iron redox system, 20 percent of the original DDT was converted to DDD after 7 days. It was concluded that DDT underwent an irreversible redox type of reaction. A mechanism is proposed for the degradation of DDT whereby electrons furnished by the reduced organic substrate are transferred to the DDT molecules via the ferrous ions thus initiating a free radical reaction in the absence of oxygen. (Mackan-Battelle)

POTENTIAL SOURCES OF ERROR IN THE MEASUREMENT OF LOW RATES OF PLANK-TONIC PHOTOSYNTHESIS AND EXCRETION, Southampton Univ., (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-11838

EVALUATION OF PYRITIC OXIDATION BY MOSSBAUER SPECTROMETRY, Carregie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science. R. A. Baker. R. A. Baker. Water Research, Vol 6, No 1, p 9-17, January 1972. 6 fig, 3 tab, 3 ref.

Group 5B-Sources of Pollution

Descriptors: *Pyrite, *Oxidation, *Monitoring, *Mine wastes, Water analysis, *Spectroscopy, Mineralogy, Radioactivity techniques, Automation, Instrumentation, Computers, Iron bacteria, tion, Instrumentation, Computers, Iron bacteria, Iron oxides, Mine drainage, Acid mine water, Aqueous solutions, Radiation, Gamma rays, Iron, Ions, Pollutant identification, Evaluation Ferrobacillus, Iron compounds, Sulfur bacteria, Kinetics, Spectrometers.

Identifiers: *Mossbauer spectroscopy, Ferrobacillus ferrooxidans, Ferrobacillus sulfooxidans, Thiobacillus thiooxidans, Backscattering detector, Co-57, Chemical interference.

Both unreacted and oxidized pyritic minerals were differentiated in water using Mossbauer effect spectroscopy together with a backscattering mode detection of 14.4 KeV gamma rays and using 100 mCi Co-57 in the form of cobaltous oxide as the radiation. Samples were mounted as close as possible to the detector window beneath a vertically oriented Mossbauer unit and radiation counts were measured over specific time intervals. The counts were transferred to tape and printed format and analyzed by an IBM 360 computer and final absorption spectra were prepared on a Calcomp Plotter. Spectra were successfully obtained of mineral surfaces submerged under 2 mm water. Oxidation reaction rates were sufficiently slow to allow scans over 24-hr periods making the detection of minor concentrations of reaction product more likely. Since ions in aqueous solutions do not absorb radiation, the results suggest a means of examining pyritic surface reactions without interference from concurrent reactions in the aqueous phase. (Mortland-Battelle) W72-11839

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL AP-Karolinska Institutet, Stockholm (Sweden), Dept.

of Environmental Hygiene.
For primary bibliographic entry see Field 05C.
W72-11842

THE ESTIMATION OF CELL NUMBERS OF FLAGELLATE COCCOID FLAGELLATE AND COCCOID CHLOROPHYTA IN NATURAL POPULA-

TIONS, University Coll. of North Wales, Bangor. Christine M. Happey. Br Phycol J. 5 (1): 71-78, Illus, 1970. Identifiers: "Chlorophyta, "Coccoid, "Flagellate, "Cell numbers, Populations, Ultrasonication.

Methods for the quantitative estimation of the small coccoid and flagellate Chlorophyta in natural algal communities are outlined. Experiments to demonstrate the precision of these methods are discussed and the components of variance are cal-culated for several experimental procedures, both for phytoplanktonic and benthic associations. The smallest overall variance for phytoplankton estimations is 27% where a large number of samples were collected and bulked to reduce the sampling error. The precision in counting epipelic algae by this method is only 12%. This result suggests that the inclusion of a short period of ultrasonication may reduce the overall variance in estimation by randomizing the distribution of the algae prior to plate inoculation. Close agreement exists between direct counts and plate counts. It is realized that the cultural approach has limitations, but comparison with results obtained from other methods indicates the advantages of cultural techniques, particularly when estimating small or motile algae.—Copyright 1972, Biological Abstracts, Inc. W72-11858

DISTRIBUTION OF IRON, MANGANESE, COPPER, ZINC, AND SILVER IN OYSTERS ALONG THE GEORGIA COAST, Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 05C. W72-11865.

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 02E.

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES, Purdue Univ., Lafayette, Ind. Water Resources

Research Center.

For primary bibliographic entry see Field 05C. W72-11867

ARTIFICIAL SURFACES AS A METHOD OF STUDYING POPULATIONS OF BENTHIC MICRO-ALGAE IN FRESHWATER, Glasgow Univ. (Scotland). Dept. of Zoology.

R. Tippett. Br Phycol J., Vol 5, No 2, p 187-199, 1970. Illus. Identifiers: *Algae, Artificial surfaces, Benthos, Diatoms, *Methodology, Populations, Season, Slides, Substrates, Sampling.

Most work on the ecology of communities of at-tached algae has involved the investigation of populations which develop on artificial surfaces exposed in the water for a known period of time. The nature and position of the surface and length of time of exposure have been shown to influence the population which develops. No studies have related the structure of these populations to populations on natural surfaces. Microscope slides which had been exposed in a pond and a stream for 2 and 4 wk were sampled over a period of more than 1 yr, and natural vegetation was sampled at the same time. The populations of attached diatoms on each substrate were analyzed. The diatoms in the pond grew mainly in summer on the slides and in winter on the natural host. In the stream the main growth of the population was over the summer period in all cases. There were twice as many species of diatoms growing on natural hosts as on the slides, and the percentage importance of the species was different. The time of vear at which some species grew was different on the slides and the natural vegetation. It was concluded that under these conditions the use of artificial surfaces is not a valid ecological method.-Copyright 1972, Biological Abstracts, Inc. W72-11873

OIL POLLUTION OF WATER SUPPLIES-TASK

GROUP REPORT.

American Water Works Association, New York.

Committee on Oil Pollution of Water Supplies. For primary bibliographic entry see Field 05G. W72-11893

INDUSTRIAL WASTES AND WATER SUP-

Illinois State Water Survey, Urbana For primary bibliographic entry see Field 05D.

FOREST CUTTING AND INCREASED WATER VIELD.

Forest Service (USDA), Elkins, W. Va. Elkins Research Center.
For primary bibliographic entry see Field 04C. W72-11916

TRACE ELEMENTS IN SEWAGE SLUDGES, Macaulay Inst. for Soil Research, Aberdeen (Scot-

M. L.Berrow, and A. J. Webber. Journal of Science of Food and Argiculture, Vol. 23, p 93-100, January 1972. 2 tab, 17 ref.

Descriptors: *Sewage sludge, *Trace elements, Spectroscopy, Sewage effluents, Chemical analysis, Copper, Zinc, Lead, Manganese, Nickel, Chromium, Strontium, Electrodes, Separation techniques, Solubility, *Pollutant identification, Water pollution sources, Soil analysis, Toxicity, Molybdenum, Methodology, Boron, Beryllium, Cadmium, Cobalt, Iron, Titanium, *Heavy metals, *Photometals, *Photome

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Identifiers: Tin, Vanadium, Bismuth, Ashing, England, Wales, Microphotometry, Solution-spark analysis, Barium, Gallium, Lathanum, Lithium, Scandium, Yttrium, Zirconium, Sample preparation, Dissolved metals.

Analyses were carried out on 42 sewage sludge les from rural and industrial towns in England and Wales for total trace and soluble element determinations. In order to determine the total trace element content, dried sludge was ground, and ashed at 450 C overnight. A portion of the ash was filled into a carbon electrode, after mixing with pure carbon powder (1:1), and then analyzed by the semiquantitative cathode layer direct current arc spectrographic method developed by Mitchell. The extractable trace element content was ascertained from samples prepared by extracting dried sludge with acetic acid, oxidizing the dried filtrate with HNo3, evaporating the product with 6 N HCl, and then absorbing it in hot 3 N HCl. Aliquotes of this solution were subjected to direct current are advantaged. tion were subjected to direct current arc analyses. porous-cup, solution-spark analysis, and a record-ing microphotometer method. Total contents of 5 percent Zn, nearly 1 percent Cr and Cu, and 0.5 percent Ni were found in certain dried sludges. Total contents of Cu, Sn, and Zn and, to a lesser extent, Ag, Bi, and Po were much greater than the levels of these elements in soils. Total Cr and Ni were very high in a small number of samples, and acetic acid-soluble Zn and Cu levels were generally very much greater than in soils. Overall, Mn, Ni, and Zn had considerably higher percent-Mn, Nı, and Zn had considerably higher percentage solubilities than Cr, Cu, Mo, Pb, Sn, and V. Zn, Cu, and Ni appear to be the elements most likely to give rise to toxicity problems in plants due to the use of sewage sludge as a soil additive. (Mackan-Battelle) W72-11933

A MATHEMATICAL SIMULATION OF BEEF

ANIMALS--A REALITY WITH POTENTIAL, Oklahoma State Univ., Stillwater. M. D. Paine, J. A. Witz, A. F. Butchbaker, J. E. McCroskey, and C. M. Bacon.

Paper presented at the 1971 Fall Meeting, Oklahoma Section, American Society of Agricultural Engineers Stillwater, November 5, 1971. 21 p., 7fig., 3 tab, 9 ref.

Descriptors: *Mathematical models, *Cattle, *Environmental effects, *Computer models, Computer programs, Simulation analysis, Model studies, Numerical analysis, Data processing, Energy transfer, Metabolism, Theoretical analysis, Optimization, Feed lots, Nutrient requirements,

Energy. Identifiers: Thermal activity, Energy balance.

The development of beef feedlots with one time capacities of 30,000 head and more has created a need for better mathematical estimates of the effects of climate and nutrition upon beef production. This greater production places greater detion. This greater production places greater unands upon management and encourages the use of systems modeling techniques to develop a better mathematical model of a beef animal than existed. This model would allow data from feeding trials to be applied to another location in a dif-ferent environment. The basic conceptual model is represneted by a combination of three energy reservoirs with energy flow between the reservoirs. These reservoirs represent digestion, metabolism, and thermal activity. The model can then simulate growth responses to energy intake and environmental factors. The model can thus be

used to calibrate optimum values of the parameters used in a simulation and thus show the most ters used in a simulation and thus show the most economical feed ration or any other such factor. The model should prove, after further calibration, useful in feedlot situations. The present model and optimization routines can now be used to predict results of management decisions. (Dorland-Iowa State) W72-11937

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MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATE-

Army Engineer District, New York. For primary bibliographic entry see Field 04A. W72-11951

A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, MARIN COUNTY, CALIFORNIA, Geological Survey, Washington, D.C. H. B. Fischer.

ri. B. Fischer. Available from GPO, Washington, D C 20402 Price 65 cents. Geological Survey Professional Paper 582-B, 1972. 32 p, 11 fig, 1 plate, 2 tab, 13 ref.

Descriptors: *Dispersion, *Mixing, *Path of pollutants, *Numerical analysis, *Mathematical models, *California, Lagoons, Bays, Water pollution sources, Dye releases, Tracers, Computer programs. Identifiers: *Bolinas Lagoon (Calif).

A numerical method is given to predict the move-ment and dispersion of a pollutant in a tidal em-bayment. To use the method requires a knowledge of the embayment geometry and of a typical tidal cycle of water-surface elevations at various interior points. Each time increment includes a convecor points. Each time increment includes a convective step, a diffusive step, and a concentrationdecay step. The computer program will generate
the motion and dispersion of a concentrated slug
of pollutant, or it will predict the concentration of
pollutant at all points within the embayment resulting from a constant discharge at one point. The
method was verified by predicting the dispersion
of a slug of pollutant discharged near the mouth of
Bolinas Lagoon, Calif. A field experiment is
described in which a slug of Rhodamine WT dye
tracer disperses in reasonable conformity to the
numerical prediction. A study was also made of numerical prediction. A study was also made of the benefit resulting from detention of the polluthe orient resulting from detention of the pollu-tant during a 2-hour period at low tide. In this case a significant concentration reduction was ob-served in those parts of the lagoon which were previously the most seriously polluted. (Knapp-USGS) W72-11985

OXYGEN DEPLETION IN ICE COVERED

RIVER, Alberta Univ., Calgary. Dept. of Civil Engineer-

ing. P. H. Bouthillier, and K. Simpson. Journal of the Sanitary Engineering Division, American Society of Civil Engineers Vol 98, No SA2, Paper 8841, p 341-351, April 1972. 7 fig, 3

Descriptors: *Oxygen sag, *Biochemical oxygen demand, *Path of pollutants, *Ice cover, Rivers, Canada, Cold regions, Oxygen demand, Water pollution, Waste assimilative capacity. Identifiers: *Red Deer River (Alberta).

Oxygen depletion of river waters is the most critical effect of municipal wastes in areas where the climate produces ice cover for a considerable part of the year. Studies of the Red Deer River in Alberta were carried out in the winter of 1970-71. Dissolved oxygen use during the critical winter period is much in excess of what might be ex-

pected from estimates based on the biochemical oxygen demand (BOD) of the wastes being discharged to the river. The rate of oxygen use is also very high in comparison to rate constants commonly used in estimating the oxygen sag of streams. Data obtained in this study are plotted to streams. Data obtained in this study are plotted to show the relationship between the oxygen use in the river, the BOD, and the total organic carbon based on river samples below the point of waste discharge. A comparison of river oxygen use to estimates based on waste analysis is also presented. (Knapp-USGS)

W72-11989

DISPERSION FROM RECHARGE WELL, Missouri Univ., Columbia. Dept. of Civil En-

gineering. C. W. Lenau

Ournal of the Engineering Mechanics Division, American Society of Civil Engineers Vol 98, No EM2, Paper 8813, p 331-344, April 1972. 6 fig, 9 ref, append.

Descriptors: *Dispersion, *Waste disposal wells, *Path of pollutants, *Recharge wells, Diffusion, Mixing, Groundwater movement, Seepage, Waste

The dispersion of waste water from a recharge well is studied. The well is situated in a confined aquifer through which there is a natural uniform flow. The convective-dispersion equation is solved by application of the Fourier transform and the by application of the Fourier transform and the Wiener-Hopf technique. By replacing the local seepage velocity with the uniform flow velocity the convective-dispersion equation was solved by the Wiener-Hopf techniques. A closed form solution was obtained for the special case when longitudinal dispersivity equals 0. For problems likely to be encountered in practice this special case adequately describes the distribution of concentration. (Knapp-USGS) W72-11992

MILITARY FACILITIES AND ENVIRONMEN-TAL STRESSES IN COLD REGIONS, Cold Regions Research and Engineering Lab.,

nanover, N.H.
R.P. Murrmann, and S. Reed.
Army Cold Regions Research and Engineering
Laboratory Special Report 173, June 1972. 21 p, 9
fig, 3 tab, 29 ref. 4A062112A891.

Descriptors: *Cold regions, *Permafrost, *Air pol-lution, *Water pollution effects, *Environmental effects, Oil spills, Ice fog, Tundra, Sanitary en-gineering, Waste disposal, Construction.

gineering, Waste disposal, Construction.

The Corps of Engineers has responsibility for construction and operation of many types of military facilities in a manner which is compatible with environmental concerns. The types of stresses imposed by military activities on the environment are not well known, nor is it possible in most cases to quantify or predict the impact of stresses on a long-term basis. This report was prepared as a preliminary step to identifying research problems which arise as a special consequence of military facilities in cold regions. Atmospheric impacts of military facilities are due primarily to emissions of combustion by-products. This problem differs in cold regions due to a combination of factors including local environmental conditions which cause accumulation of pollutants, higher inputs due to disposal and energy requirements, and the influence of temperature on physical and chemical interactions of combustion products. Under extreme conditions, the unique condition of ice fog interactions of combustion products. Order ex-treme conditions, the unique condition of ice fog occurs for which there is apparently no practical solution. Terrain impacts result from disposal on land of all types of solid and liquid wastes. Due to land of all types of solid and induid wastes. Due low temperature conditions, these wastes do not undergo biological or chemical degradation at desirable rates. Permafrost in arctic and subarctic areas exists in a delicate state of thermal balance

which may be perturbed by alsmost any activity. (Knapp-USGS) W72-12014

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS, Laboratory of Limnology, Leningrad (USSR). V. G. Drabkova. Hydrobiological Journal, Vol 7, No 1, p 21-27, 1971. 1 fig, 2 tab, 21 ref. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 7, No 1, 1971.).

Descriptors: *Lakes, *Aquatic microbiology, *Aquatic bacteria, *Iron bacteria, Iron, Iron oxides, Oxygen, Oxygen sag, Oxidation, Oxidation-reduction potential, Hydrogen ion concentration, Temperature, Thermal stratification, Thermocline, Epilimnion, Mixing, Bottom sediments, Summer, Hypolimnion.
Identifiers: *USSR, *Karelian Isthmus, *Oozes, Mataliarsia.

Concentration and distribution of iron bacteria, temperature and oxygen conditions, and oxidation-reduction potential and pH of coze in 8 lakes of the Karelian Isthmus were investigated in the summers of 1964-65. The low redox potential of coze in most of the lakes is conducive to reduction and conversion of iron hydroxide to dissolved ferrous oxide, which, on dissolving in water, is again oxidized by the iron bacteria. The redox potential is lowest in the eutrophic lakes. The water of Lake Vishnevskoye contains the largest amount of iron bacteria (20%-25% of the total number), especially in the bottom layer at the end of the ice period. In meromictic Lake Uzornoye where iron concentration at the bottom is about 71 ing/liter, iron bacteria develop at the boundary between the aerobic and anaerobic zones. No iron bacteria occur in Lake Michurinskoye, which is characterized by inand anaerobic zones. No iron bacteria occur in Lake Michurinskoye, which is characterized by in-tensive mixing of water and by a high Eh of the ooze. The almost complete absence of iron bac-teria in acidic, dystrophic Lake Serpovidnoye results in a fairly high ferrous oxide concentration in the water. (Josefson-USGS) W72-12015

SOLUBILITY OF HYDROCARBONS IN WATER UNDER STRATAL CONDITIONS (O RAST-VORIMOSTI UGLEVODORODOV V VODE V PLASTOVYKH USLOVIYAKH), Akaemiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh. For primary bibliographic entry see Field 02K. W72-12022

DENSITY INDUCED MIXING IN CONFINED

AQUIFERS,
Massachusetts Inst. of Tech., Cambridge. Ralph
M. Parsons Lab. for Water Resources and Hydrodynamics.

L. W. Gelhar, J. L. Wilson, J. S. Miller, and J. M.

Hamnek. Copy available from GPO Sup Doc EP 2.10:16060 ELJ 03/72 for \$1.25; microfiche from NTIS as PB-211 298, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, 1972. 130 p, 36 fig, 7 tab, 28 ref, 3 append. EPA Program 16060 ELJ 03/72.

Descriptors: *Mixing, *Dispersion, *Path of pollutants, *Waste disposal wells, Density stratification, Injection wells, Stratified flow, Artificial recharge, Hydraulic models, Confined water, Artesion aquifers.

Analytical techniques are given to describe the mixing of two fluids of different density in a confined aquifer, in which one fluid is introduced to the aquifer by well recharge. The immiscible displacement process in both linear and radial flows is analyzed and the effects of longitudinal and lateral dispersion are included using a boundary layer approximation. Hydrodynamic dispersion re-

Group 5B-Sources of Pollution

tards gravity segregation due to density difbetween the theoretical predictions and experi-mental results was found and the predicted retarding effects of longitudinal dispersion are verified. During withdrawal some systematic differences between the theory and observation were noted. Theoretical predictions of recovery efficiency during a recharge-storage-withdrawal sequence show trends similar to those observed but are typically 5% to 10% lower than those observed. Direct theoretical predictions of recovery efficiency during single or multiple sequences of recharge-storage-withdrawal were developed for an immis-cible system, and similar developments outlined for miscible displacement. (Knapp-USGS)

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.

P. F. Pratt.

Copy available from GPO Sup Doc as EPA 16060 DOE 04/72, \$0.55; microfiche from NTIS as PB-211 166, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 45 p, 9 fig, 9 tab, 12 ref. EPA Program 16060 DOE 04/72.

Descriptors: *Nitrates, *Water pollution sources, *Return flow, *Fertilizers, *Path of pollutants, Nitrification, Denitrification, Nitrogen, Irrigation practices, California, Leaching, Nitrogen compounds, Nutrients. Identifiers: *Santa Ana River basin (Calif).

Factors that have an effect on the nitrate in drainage water under lands used for citrus and row crops in the Santa Ana River basin in Southern California are the difference between N input and N removed by harvested crops, the drainage volume in which the nitrate is dissolved, mineralization of N from the organic pool, and denitrification. The N input minus N removed in harvested crops provides a reasonable estimate of the nitrate that will leach to the groundwater from soils that have open-porous profiles with no layers that restrict water movement and in which there is no net change in the N in the organic pool. The transit times measured for drainage water to move to the groundwater suggests that the effects of agricultural land use in the 1920 to 1940 period are showing in wells in 1971 and that the effects of present practices will not show until about 1990 or 2000. Recommended practices for fertilizer N for citrus are such that when combined with adequate leaching and good yields will put no more than about 20 ppm nitrate into drainage effluents, as-suming no denitrification. Very careful management could reduce this estimate to near 10 ppm. Recommended practices for N fertilizer in row crops would put the nitrate concentration between about 20 to 50 ppm, assuming no denitrification. (Knapp-USGS) W72-12042

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION STUDIES, Water Pollution Research Lab., Stevenage (En-

K. G. Robertson

Institution of Electronic and Radio Engineers, Conference on Electronic Engineering in Ocean Technology, Proceedings, No. 19, September 21-24, 1970, (Water Pollution Research Laboratory Reprint No. 610), 14 p, 10 fig, 12 ref.

pollution *Water Descriptors: sources. *Radioisotopes, *Dispersion, *Pollutant identifi-cation, *Path of pollutants, *Outfalls. Identifiers: *Sewage outfalls, *Bromine-82. To study the dispersion of sewage and other wastewaters, discharged to the sea or to estuaries, a tracer (bromine-82) is added continuously to the discharge from a submerged outfall or alternative-ly as a single dose at the site of a hypothetical outly as a single doze at the act of the ly act ment is mounted in the towing boat. The replay system provides computer-compatible paper tape. Results of typical surveys are given. (Goessling-W72-12057

SAND AND GRAVEL OVERLAY FOR CON-TROL OF MERCURY IN SEDIMENTS, Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.

For primary bibliographic entry see Field 05G. W72-12069

POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS, Advanced Technology Center, Inc., Dallas, Tex. For primary bibliographic entry see Field 05G. W72-12070

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS,

Hydroscience, Inc., Westwood, N.J. E. L. Barnhart, and G. R. Campbell. Copy available from GPO Sup Doc EPA 12020 EXG 03/72, \$1.00; microfiche from NTIS as PB-211 160, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1972. 103 p, 38 fig, 17 tab, 13 ref. EPA Program 12020 EXG 03/72.

Descriptors: *Chlorination, *Chemical reactions. *Biodegradation, Bioassay, Activated sludge, Toxicity, Instrumentation, Ecosystems, Food chains, Microorganisms, Laboratory tests, Waste

water treatment.
Identifiers: *Degradation products, *Organic chemicals, *Respirometer studies.

Fourteen industrial organic chemicals were examined for their persistence through biological treatment, either as the initial compounds, or as degradation products. Semi-continuous activated dge systems were employed. The ability of each of the chemicals to participate in reactions with free chlorine was then determined in a series of batch experiments. Certain of the test compounds formed persistent degradation products during treatment. Five of the initial compounds reacted readily with chlorine, under conditions commonly employed in effluent chlorination. Five of the chlorination products were further studied in respirometer experiments to evaluate their per-sistence in mixed microbial systems. Their toxicity from the first transfer of the static bioassay procedure. A series of bench scale, continuous flow ecosystems were established for the evaluation of longer term effects of three of the chlorination products. Several varieties of organisms, representing different levels in the food chain, were studied. (Lowry-Texas) were studie W72-12074

RESIDUES IN FISH, WILDLIFE, AND ESTUA-RIES, Bureau of Fisheries and Wildlife Service, Sacra-

mento, Calif. Div. of River Basin Studies. R. D. Earnest, and P. E. Benfille, Jr. Pesticides Monitoring Journal, Vol 5, No 3, p 235-241, December 1971. 5 tab. 12 ref.

Descriptors: *California, *Estuaries, *Fish, *Crabs, *Perches, *Pesticide residues, *DDT, *DDE, *DDD, Lipids, Correlation analysis, Pollutant identification, Water pollution sources. Identifiers: *San Francisco Bay.

Residue levels of DDT and its metabolites, along with lipid concentrations, were studied in eight fish species and one crab species from two areas in San Francisco Bay in 1969. The highest residue levels were found in dwarf and shiner perch and the lowest in flatfish and crabs. Correlation coefficients for percent lipid versus DDE, DDD, DDT, and total DDT were calculated. A positive correla tion of (P < .05) between percent lipid and DDT and its metabolites was found in white perch, pile perch and staghorn sculpin while a negative correlation was observed in dwarf perch. (Ensign-W72-12077

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HYDRAULIC MODEL TEST ON THE DIFFU-SION OF INDUSTRIAL WASTE-WATER IN

THE SEA, Mitsubishi Heavy Inudstries Ltd., Kobe (Japan).

Kobe Technical Inst. S. Koyama, T. Kyogoku, and T. Hamaoka. Mitsubishi Heavy Industries, Vol. 8, No. 3, p 12-18, 1971. 10 fig, 6 ref.

Descriptors: *Hydrualic models, *Simulation analysis, *Industrial wastes, *Thermal pollution, *Diffusion, Waste water (Pollution), Gravity, Tides, Currents, Pumps, Valves. Identifiers: *Japan, *Model tests.

Hydraulic model tests were carried out at the Kobe Technical Institute on the diffusion of waste-water as a preventive measure against water and thermal pollution. The Froude criterion was used to achieve the similitude of gravity and inertia force. Tanks used in the tests were 19 m x 12 m x 1 m and 8 m x 6 m x 0.5 m respectively. Exact simulations of tidal range, tidal times, tidal currents and ocean currents were set at the seaward end of the model. Pumps and valves were interlocked with the tide generator to simulate currents. Similitude theory, methods and equipment are described. (Ensign-PAI)

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

A. Preston. Underwater Journal and Information Bulletin, Vol. 4, No. 2, p 49-58, April 1972. 1 fig, 3 tab, 21

Descriptors: *Radioactivity, *Water pollution sources, *Disposal, *Control systems, Environ-mental effects, Monitoring, Regulation, Irradia-tion, Radioactivity effects, Public health. Identifiers: ICRP, Acceptable dose limits.

Artificial radioactivity as a marine water contaminant is discussed considering both the history of the problem and future projections. The main objective of controlled disposal is to ensure that irradiation to the public is within International Commission on Kadrological Protection (ICRP) recommended dose limits. Control is achieved by assessing the potential consequences of proposed disposal by application of critical path analysis techniques. If this objective is achieved damage to marine resources is completely negligible. Where significant fractions of the limiting capacity are utilized, sensible monitoring operations are conducted including monitoring based on results of a critical path analysis. The need for careful assessment and monitoring will be greatest in shallow estuaries and coastal waters and may grow to requirement for regional, national and in-ternational monitoring. (Ensign-PAI)

CONCENTRATION AND DISTRIBUTION OF OIL POLLUTANTS IN HALIFAX HARBOUR, 10 JUNE TO 20 AUGUST 1971, Bedford Inst., Darmouth (Nova Scotia). Marine

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Ecology Lab. P. A. Michalik, and D. C. Grodon, Jr. Technical Report No. 284, October 1971. 28 p, 2 fig, 3 tab, 4 ref, 1 append.

Descriptors: *Canada, *Oil pollution, *Pollutant identification, *Sampling, *Spectrophotometry, Analytical techniques, Weather, Hydrography, Sewage, Ships, Industrial wastes, Accidents. Identifiers: *Halifax Harbour, Oil concentrations,

A survey of oil concentrations was conducted in Halifax Harbour from June 10 to August 19, 1971. The pollution stems from ships releasing oily wastes, refinery accidents and sewer discharge. Sampling was carried out at 15 stations in the Harbour along with additional surface samples at all times. Spectrophotometric analyses were per-formed. Results of the analyses on all oil concentrations are presented along with weather condi-tions, sea state, rainfall, visual observations, oil type and distribution patterns. (Ensign-PAI) W72-12089

IMPACT OF PETROLEUM SPILLS ON THE CHEMICAL AND PHYSICAL PROPERTIES OF THE AIR/SEA INTERFACE, Naval Research Lab., Washington, D.C. W. D. Garrett.

Available from the National Technical Informa-National Technical Information Service as AD-738 423, \$3.00 in paper copy, \$0.95 in microfiche. NRL Report 7372, February 16, 1972. 20 p, 4 fig, 41 ref. RR 131-03-41-5907. NRL Problem G02-03.

Descriptors: *Oil spills, *Air-water interfaces, *Water pollution effects, *Physical properties, *Waves (Water), *Capillary action, *Gases, *Organic matters, Dispersion, Meteorology. Identifiers: *Oil slicks, *Wave damping, Windwave interaction, Gas exchange, Liquid-solid exchange, Organic fallout concentration, Global impact.

impact.

Spreading time of oil spilled on the sea depends on the spill volume, character of the oil and the meteorological condition of the area. The oil is degraded to tarlike lumps and stable water-in-oil emulsions by weathering, dispersion and air/sea dynamics. Oil in these states has a long life in the sea and can influence the properties, and modify exchange processes of the air/sea interface. Capillary, waves are resisted and attenuated and lary waves are resisted and attenuated and wind/wave interaction is uncoupled through the elimination of form drag. Gass exchange can be in-hibited liquid and solid exchange is altered, organic fallout becomes concentrated at the surface by the oil and oil is transported into the marine atmosphere. Oils tend to replace a high-surface-tension, active water surface with a more stolid, less mobile organic/air interface. (Ensign-PAI) W72-12090

MARINE AND FRESH WATER POLLUTANTS, (POLLUTIONS MARINES ET POLLUTIONS DES EAUX DOUCES),. Institut Pasteur, Lille (France). Laboratoire d'-

Hydrobiologie. For primary bibliographic entry see Field 05C. W72-12096

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS, Univ., Honolulu. Water Research Center. For primary bibliographic entry see Field 04B. W72-12101

INDUSTRIAL WASTES: EFFECTS ON TRINITY RIVER ECOLOGY, FORT WORTH, TEXAS. Texas Christian Univ., Fort Worth. Dept. of Biolo-

For primary bibliographic entry see Field 05C.

ISOLATION OF LYTIC AGENTS RELATED TO

Randolph-Macon Coll., Lynchburg, Va. For primary bibliographic entry see Field 05A. W72-12120

VIRUCIDAL ACTIVITY OF TWO IODOPHORS

TO SALMONID VIRUSES, Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab. For primary bibliographic entry see Field 05C. W72-12160

MICROBIAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS) SUBJECTED TO ULTRAVIOLET-IRRADIATED SEAWATER, Oregon State Univ., Corvallis. Dept. of Food

Science and Technology.
G. J. Vasconcelos, and J. S. Lee.
Applied Microbiology, Vol. 23, No. 1, p 11-16,
January 1972. 3 fig, 4 tab, 31 ref.

Descriptors: *Marine microorganisms, Water pollution sources, *Ultraviolet radiation, *Oysters, *Pathogenic bacteria, *Irradiation, Marine fungi, Mollusks, Water pollution effects, Yeasts, Aerobic bacteria, Isolation, Biochemistry, Biological properties, Marine bacteria, Coliforms, Pseudomonas, Water sampling, Marine animals, Shellfigh, Cultures, Engagers. ish, Cultures, Enzymes. ish, Cultures, Enzymes.

Identifiers: Biochemical tests, Sample prepara-tion Acinetobacter. Moraxella, Bacillus,

tion, Acinetobacter, Moraxella, Flavobacterium, Cytophaga, parahaemolyticus, Vibrio alig Vibrio aliginolyticus, Aeromonas, Lactobacillus, Staphylococcus aureus, Culture media, Crassostrea gigas, Most probable number test, Pseudomonads.

The ability of oysters to rid themselves of bacterial contaminants was studied by comparing dif-ferences in the microbial flora of oysters which were and were not exposed to seawater irradiated by UV at an intensity of 960 microwatts/min/sq cm. Isolation of microbes from oysters was accomplished by spread-plating asceptically homogenized oysters onto nutrient agar. Those from seawater were isolated by passing samples over gridded Millipore filters. Gram-positive or-ganisms were restreaked on Brain Heart Infusion agar (BHI) and incubated at 25 C for 3 days before coagulase, hemolysis, and deoxyribonuclease ac-tivity were tested. Results indicated that the microbial flora, except coliforms, remained unchanged in those oysters exposed to UV radiation. The coliform count (MPN) was reduced from tion. The conform count (MPN) was reduced from 17 to less than 0.18 per 100 ml in those oysters exposed to the irradiated sea water. Some Pseudomonas species were also removed, but other harmful microorganisms such as gram-positive cocci and Vibrio species persisted for a longer period. The effects of lowering coliform counts by UV exposure and the similarity in bacterial composition in oysters and see water showed that composition of an oyster's flora is related to its environment. (Long-Battelle)
W72-12164

CHEMICAL CHARACTERISTICS OF HUMIC COMPOUNDS ISOLATED FROM SOME DECOMPOSED MARINE ALGAE,

Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab. M. A. Rashid, and A. Prakash. Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 55-60, January 1972. 3 tab, 30 ref. Descriptors: *Chemical analysis, *Decomposing organic matter, *Marine algae, Humus, Organic compounds, Pollutant identification, Aqueous solutions, Ion exchange, Methodology, Organic acids, Fulvic acids, Kelps, Water analysis, Exudation, Water pollution sources, Phaeophyta, Oxidation.

Identifiers: *Humic compounds, Column chromatography, Fucus vesiculosus, Laminaria digitata, St. Margaret's Bay, Scoudouc River, Humic acids, Oximation, Sample preparation.

The chemical characteristics of humic compounds isolated from decomposed marine algae were determined and compared with those extracted from river water. The chemical nature of humic compounds isolated from the exudates of live, intact plants of Fucus vesiculosus and Laminaria digitata was determined by analyses of their functional groups, molecular weight, elemental com-position, and certain spectral properties. Water samples with a high, dissolved humic content were obtained from St. Margaret's Bay, Nova Scotia and Scoudouc River, New Brunswick. After the impurities were removed, the molecular weight was determined by a column chromatographic technique using Sephadex gels and total acidity measured by barium hydroxide solution in N2. The carboxyls were determined by ion-exchange with calcium acetate solution, and the carbonyls by oximation. The data for oxygen-containing functional groups indicated that as compared to humic acids, the fulvic acids showed relatively large values of total acidity and 1.5 - 2.5 times higher carboxyl content. The phenolic hydroxyl group content was low (0.0-1.0 milliequivalents per gram) in all sam-ples and appeared to be characteristic of humic compounds originating originating in the marine environment. Except for Laminaria humic acids, carbonyl groups were high in all samples, particu-larly the fulvic acids isolated from river water and Laminaria exudate. In general, the molecular weight properties of humic and fulvic acids were similar to the corresponding fractions previously obtained from marine sediments. Optical density tests indicated a higher degree of condensation for marine as compared with freshwater humic com-pounds. (Byrd-Battelle) W72-12166

ACCUMULATION OF ALDEHYDE INTER-MEDIATE BY PSEUDOMONAS AERUGINOSA IN GROWING CULTURE ON TETRADECANOL, (ANREICHERUNG DER AL-DEHYDZWISCHENSTUFE AUS DER AUS VON WACHSENDEN KULTUR DOMONAS AERUGINOSA BEIM ABBAU VON TETRADECANOL), Muenster Univ. (West Germany). Institut fuer Mikrobiologie. H. Buning-Pfaue, and H. J. Rehm.

Descriptors: *Oxidation, *Microbial degradation, Bacteria, Pseudomonas, Aerobic bacteria, Chemical reactions, Organic compounds, Cultures, Biodegradation, Metabolism, Absorption, Al-cohols, Aquatic bacteria, Water pollution sources, Pollutant identification, Pathogenic bacteria. Identifiers: *Pseudomonas aeruginosa, *Substrate utilization, *Tetradecanol, Aldehydes, Paraffins, Tetradecanol, Accumulation, 2 4-dinitrophenyl-hydrazon, Semicarbazone, Culture media.

Archiv fur Mikrobiologie, Vol. 82, No. 3, p 213-218, March 10, 1972. 3 fig, 14 ref.

In the oxidation of tetradecanol by Pseudomonas aeruginosa, tetradecanol was accumulated as semicarbazone and was identified as 2.4dinitrophenylhydrazon. This confirms the possibility of production of an intermediate aldehyde out of the growing culture. (Holoman-Battelle) W72-12170

Group 5B-Sources of Pollution

SYNTHESIS BY ZOOGLOEA RAMIGERA 115 GROWN IN THE PRESENCE OF ETHANOL,

Ohio State Univ., Columbus. Dept. of Microbiolo-

G. H. Joyce, and P. R. Dugan. Applied Microbiology, Vol. 23, No. 3, p 547-552, March 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Water pollution sources, *Pollutant identification, *Gas chromatography, Sampling, Cultures, Aerobic bacteria, Alcohols, Organic

Identifiers: *Fatty acids, *Thin-layer chromatography, *Zoogloea ramigera, Paper chromatog-raphy, Gas-liquid chromatography, Infrared spec-troscopy, Column chromatography, Substrate utilization, Culture media, Esters, Ethanol.

Zoogloea ramigera, a floc-forming bacterium indigenous to waste treatment plants and natural waters, was grown on a basal medium supplemented with short-chain alcohols (C1,-C8) WHICH GAVE AN ESTER=LIKE ODOR. In order to characterize and identify this odor, vari-ous analytical tests were performed. Samples were taken several times daily from a growing culture and assayed by two-dimensional thin-layer chromatography for esters and intermediate acids. Esters in liquid culture were identified by a com-bined gas-liquid chromatography and infrared spectroscopy. Results from infrared spectroscopy showed peaks corresponding to ethanol and ethyl butyrate. Data indicated that the formation of esters in the presence of alcohol-grown cells occurs more rapidly than on an alcohol-free medium. Growth on C6-C8 alcohols was considerably slower than on the shorter chained alcohols, Cl-C5. (Long-Battelle) W72-12171

MICROBIAL DEGRADATION OF STEROLS, Searle (G.D.) and Co., Chicago, Ill. Div. of Biological and Biochemical Research.

W. J. Marsheck, S. Kraychy, and R. D. Muir. Applied Microbiology, Vol. 23, No. 1, p 72-77, January 1972. 5 tab, 12 ref.

Descriptors: *Mycobacterium, *Microbial degradation, *Biodegradation, Bacteria, Cultures, Fermentation, Organic compounds, Degradation (Decomposition), Aromatic compounds, Organic

Identifiers: *Sterols, Cholesterol, Phytosterols, Culture media, Ketones, Androsta-1 4-diene-3 17-dione, Androst-4-ene-3 17-dione, Substrate utilization, Degradation products, Biotransformation,

A process is described for the microbial degrada-tion of cholesterol and plant sterols, to produce androsta-1,4-diene-3,17-dione and androst-4-ene-3,17-dione, by two newly isolated bacteria designated as Mycobacterium sp. NRRL B-3683 and Mycobacterium sp. NRRL B-3605. These myobacteria produce substantial amounts of 17ketonic compounds without appreciable degradation of the steroid nucleus. No ring degradation in-hibitory agents are necessary. The first hibitory agents are necessary. The first microbiological production of 20 alpha-hydroxymethylpregna-1,4-dien-3-one is also reported. (Mackan-Battelle) W72-12174

RAPID RECOVERY OF ESCHERICHIA COLL FROM ESTUARINE WATER,

Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit. W. H. Andrews, and M. W. Presnell.
Applied Microbiology, Vol. 23, No. 3, p 521-523,
March 1972. 3 tab, 3 ref.

coli, *Cultures, Descriptors: procedures, Enteric bacteria, Coliforms, Pollutant identification, Temperature, Evaluation, Water quality control, *Estuarine environment, Methodology, Isolation. Identifiers: Enrichment, Culture media, Standard

methods, Selective media, Recovery, En-

The reliability of E. coli recovery from field seawater samples was simultaneously compared by use of 3 methods: (1) elevated temperature test of Fishbein et al., (2) an experimental 24-hr elevated Pishbein et al., (2) an experimental 27-in deviation, and (3) the 72-inr APHA standard methods procedure. Decimal diluted samples from 68 collections were inoculated onto lauryl sulfate tryptose broth (LST) or new medium A-1 (containing lactose, tryptone, NaCl, a surfactant and salicin) and incubated at 44 and 44.5 plus or minus 0.2 C, respectively, for the rapid tests. For the APHA method, samples were inoculated onto LST for enrichment, incubated at 35 plus or minus 0.5 C for 24-28 hrs and positive tubes then transferred to 2 medium and incubated at 44.5 plus or minus 0.2 C for 24 hr. All positive tubes from the elevated temperature test were streaked on Levin's EMB ag medium and incubated at 44.5 plus or minus 0.2 C for 24-28 hr to confirm gas production at elevated temperatures. From 1,710 tubes, E. coli was recovered 222 times in lauryl tryptose medium incubated at 44 plus or minus 0.2 C for 24 hr, 261 times in a experimental medium incubated at 44.5 plus or minus 0.2 C for 24 hr, and 257 times by the 72-hr APHA method. The number of false positives enumerated was similar in all three tests. The data indicated that E. coli in raw seawater could be determined in 24 hr without a significant loss of accuracy. (Mackan-Battelle) W72-12178

SURVIVAL OF VIBRIO PARAHAEMOLYTICUS IN SHRIMP TISSUE UNDER VARIOUS EN-VIRONMENTAL CONDITIONS, Texas A and M Univ., College Station. Dept. of

Animal Science For primary bibliographic entry see Field 05C.

PRELIMINARY OBSERVATIONS ON THE UP-TAKE OF POLIOVIRUS BY WEST COAST SHORE CRABS, Notre Dame Coll., Belmont, Calif. Dept. of Biolo-

R. DiGirolamo, L. Wiczynski, M. Daley, and F. Miranda.

Applied Microbiology, Vol 23, No 1, p 170-171, January 1972. 2 fig, 9 ref.

Descriptors: Water pollution effects, *Path of pollutants, Absorption, Mollusks, Public health, Shellfish, Crabs, Commercial shellfish, Crustaceans, Marine animals, Mussels, Bioassay, Pollutant identification, Pacific Coast Region. Identifiers: *Poliovirus, *Hemigrapsus nudus, *Pachygrapsus, *Bioaccumulation, Mytilus californianus, Tissue culture, Biological magnifi-

cation, Macroinvertebrates.

The ability of West Coast shore crabs to accumulate high concentrations of poliovirus was in-vestigated by exposing the crabs to seawater containing poliovirus and to a diet of virus-con-taminated mussels. The quantity of virus taken up from contaminated water (34,000 PFU/ml) was measured by homogenizing exposed crabs and observing plaque formation on a monolayer tissue culture. Crabs allowed to feed on virus-con-taminated mussels for 12 hours were assayed for virus in a similar manner. The virus-contaminated mussels used in the experiments contained 26,000 virus PFU/g, or, on a per unit weight basis, 75 percent of the virus present in 1 ml of water. The uptake of viruses by crabs exposed to virus-contaminated seawater varied from 1,800 PFU/g in 12 hr to a high of 4,900 PFU/g in 48 hr, representing uptakes of 28 and 63 percent, respectively. Exposure to contaminated mussels for 12 hr resulted in a 74-94 percent uptake of virus by the crabs. The high percentage of viral uptake by the crabs in-dicated that the viruses were not only taken up but also concentrated. Such viral accumulation by commercial shellfish could be a potential health problem. (Long-Battelle) W72-12182

USE OF AROMATIC COMPOUNDS FOR GROWTH AND ISOLATION OF ZOOGLOEA, GROWTH AND ISOLATION OF ZOOGLOEA, Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and Pennsylvania State Univ., University Park. Dept. of Microbiology. R. F. Unz, and S. R. Farrah. Applied Microbiology, Vol 23, No 3, p 524-530, March 1972. 2 fig, 5 tab, 25 ref.

Descriptors: Water pollution sources, *Pollutant identification, Cultures, Sampling, Aerobic bacteria, Separation techniques, Spectroscopy, Laboratory tests, Metabolism, Alcohols, Aromatic compounds, Organic compounds, Chemical reactions, *Isolation, Organic acids, Amino acids,

reactions, "Isolation, Organic acids, Amino acids, Phenols, Growth rates. Identifiers: "Zoogloea, "Substrate utilization, 'Zoogloea ramigera, Culture media, Biochemical tests, Aromatic hydrocarbons, Catechols, Biological magnification, Cresol, Toluate, Benzoate

Nine Zoogloea strains were examined for their ability to utilize 35 aromatic compounds. The primary isolation of Zoogloea was carried out in basal media supplemented with an aromatic carbon source and agar (1.0 percent (w/v) final concentration). Benzoate, toluates, phenols and cresols were utilized as a carbon source by eight strains. These strains exhibited meta cleavage of catechol and of methyl-substituted catechols. With the exception of L-tyrosine, none of the aromatic compounds tested supported growth of Z. ramigera. The meta clevage products of m-toluate catabolism provided a reliable method of identifying and isolating 37 zoogloea-forming bacteria from various waste waters. They were identified as strains of Zoogloea. (Long-Battelle) W72-12186

NOTE ON THE DISTRIBUTION OF CESIUM 137 IN THE LIGURO-PROVENCAL BASIN (NOTE SUR LA DISTRIBUTION DU CESIUM 137 DANS LE BASSIN LIGURO-PROVENCAL), Laboratoire de Chimie Nucleaire

Y. Le Beyec, A. Morel, and P. Slizewicz. Cahiers Oceanographiques, Vol 23, No 9, p 859-869, November 1971. 3 fig, 20 ref. English ab-

Descriptors: *Cesium, *Distribution patterns, *Nuclear explosions, *Radioactive wastes, Diffu-sion, *Water pollution sources, Surface waters, Hypolimnion.

Identifiers: *Cesium-137, *Liguro-Provencal

Basin, Vertical exchange.

Measurements of Cesium 137 concentrations from nuclear explosions taken at various depths in the Ligurian Sea are presented. Diffusion was adequate in purifying the surface waters but the inwaters were contaminated. At depths of 1000-1500 m. concentrations were less than 10% of the surface water values. Concentrations of Cs-137 in the deep waters showed vertical exchange.
The integrated values of Cs-137 on the water column appeared smaller than generally acknowledged for overall fallout. (Ensign-PAI) W72-12187

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC

NORTHWEST RELATING TO POSSIBLE POL-

Oregon State Univ., Corvallis. Dept. of Oceanog-

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Copy available from GPO Sup Doc EP2.10:16070 EOK 07/71 SN5501-0140 Vol I, \$5.25, Vol II, 86.00; microfiche from NTIS as PB-211 275, \$0.95/vol. 1. Environmental Protection Agency, Water Pollution Control Research Series, July 1971, Vol I. 615 p; Vol II. 744 p. EPA Program 16070 EOK 07/71.

Descriptors: *Oceanography, *Pacific Northwest, *Coast review, *Bibliographies, Water pollution sources, Thermal pollution, Reviews, *Data collections, Toxicity, Path of pollutants, *Metals, Trace elements, Pesticides, Salinity, Nutrients, Algae, Aquatic animals, Radionuclides. Identifiers: *Literature reviews.

This study is limited to the coastal zone of the Pacific Northwest from high tide to ten kilometers from shore, and does not include estuaries and bays. The literature has been reviewed in 21 chapbays. The literature has been reviewed in 21 chapters including chapters on geology, hydrology, winds, temperature and salinity, heat budget, waves, coastal currents, carbon dioxide and pH, oxygen, nutrients, and biology. Special chapters deal with field studies on thermal discharges, heat dispersion models, pulp and paper industrial wastes, trace metals, radiochemistry, pesticides and chlorine, thermal ecology, and biology of 20 selected species. A summary chapter is entitled 'The nearshore coastal ecosystem: an overview.' The bibliography contains more than 3100 entries, most from the onen literature but some from unmost from the open literature, but some from unpublished reports. A separate volume (Vol II), includes the following appendices: (1) Wind Data; (2) Temperature and Salinity Data; (3) Wave Data; (4) Trace Metals (including trace metal toxicities); (5) Pesticide Toxicities; (6) Oxygen, Nutrient, and pH Data; (7) Radionuclides; and (8) An Annotated Checklist of Plants and Animals (including more than 4400 species). W72-12190

GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH,

CALIFURNIA, NEVADA, AND UTAII, Fuhriman, Barton and Associates, Provo, Utah. D. K. Fuhriman, and J. R. Barton. Copy available from GPO Sup Doc for \$2.00; microfiche from NTIS as PB-211 145, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 10 fig, 27 tab, 241 ref. EPA Program 16060 ERU 12/71, Contract 14-12-919. Contract 14-12-919.

Descriptors: *Groundwater, *Water pollution sources, Groundwater basins, Salinity, Arizona, California, Nevada, Utah, *Nitrates, *Dissolved solids, *Mineralization, *Southwest U.S.

An investigation to determine the groundwater pollution problems which exist in the states of Arizona, California, Nevada, and Utah was con-ducted. Data were obtained through an extensive review of the literature and through interviews with engineers, scientists, and governmental offi-cials concerned with water pollution in the four states of the project area. Mineralization of groundwater is the most prevalent factor in the degradation of groundwater quality in the project area. Large quantities of groundwater in each of the four states are undesirable for many uses because of excessive mineralization. Much of the mineralization of groundwater is a result of natural processes. Some is caused by man's activities--irrigation, oil field brine disposal, and over-pumping of aquifers are common causes of mineralization. Usually the degradation is caused by an excess of total dissolved solids, but at some locations, specific toxic substances are also found in the groundwater. Of the various forms of pollution of groundwater caused by man's activities, nitrate is probably most prevalent in the project area. A list-

ing of conditions causing groundwater pollution in the project area is included. W72-12193

RADIOECOLOGICAL STUDIES OF THE EN-VIRONMENT OF THE EUREX NUCLEAR PLANT AT SALUGGIA (STUDIO DI RADIOECOLOGIA OPERATIVA NEI DINTORNI DELL'IMPIANTO EUREX DI SALUGGIA), Comitate Nazionale per L'Energia Nucleare, Casaccia (Italy). Laboratorio Radioaattivita Ambientale.

A. Antonelli, M. A. Bombace, A. A. Cigna, L. Cigna Rossi, and U. Laneri.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 44 p, 1 fig, 11 tab, 8 ref.

Descriptors: *Europe, *Nuclear powerplants, *Environmental effects, *Nuclear wastes, Path of pollutants, Tracers, Tritium, Strontium radioisotopes, Radioecology, Potable water, Ir-rigation water, Milk, Food chains, Fish, Effluents,

Rivers, Mixing, Waste dilution, Systems analysis, Water pollution control, Zinc radioisotopes, Cobalt radioisotopes. Identifiers: Plutonium, Cesium radioisotopes, Zirconium radioisotopes, Cerium radioisotopes, Ruthenium radioisotopes, Manganese radioisotopes, Ruthenium radioisotopes, Ruthenium radioisotopes. um radioisotopes.

Tracer experiments were conducted of mixing in the Dora Baltea River and of the Po River downstream of its confluence with the Dora. Esti-mates were made of radionuclide pathways to man via drinking water, irrigation water (through vegetables and milk), AND FISH CONSUMP-TION. Maximum release rates (for tritium, Mn, Fe, Co, Zn, Sr, Ru, Cs, Ce, and Pu radionuclides) are listed which ensure a wide safety margin. In all cases drinking water is the more critical pathway. (Bopp-ORNL) W72-12194

TRITIUM CONTAMINATION OF THE ENVIRONMENT (UBER DIE TRITIUMKONTAMINATION DER UMWELT),

Kernforschungszentrum, Karlsruhe (West Ger-For primary bibliographic entry see Field 07C. W72-12195

APPLICATION OF EXPERIENCE IN MONITORING RADIOACTIVE WASTES TO INDUSTRIAL WASTES (ERFAHRUNGEN MIT RADIOAKTIVEN ABWASSERN ALS MODELL FUR EINE VERBESSERUNG DER UBERWACHUNG VON INDUSTRIEABWASSERNAL

Bundesgesundheiteant, Berlin (West Germany). Institut fuer Wasser-, Bodes-, und Lufthygiene. Karl Aurand.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 17 p, 8

Descriptors: *Monitoring, *Nuclear wastes, *Water pollution control, *Water pollution sources, Pesticide residues, Water sampling, Water analysis, Radioecology, Sedimentology.

Particularly with regard to the buildup of pollu-tants in ecosystems, semi-continuous methods are described for monitoring the radioactivity of sur-face-, drinking- and waste water. The samples are analyzed or stored at a central laboratory. Samplers are described for proportional sampling, for sampling water at depth, for bottom water, and for sediments. For organic pesticide determination in water at depth, only glass contacts the sample

(thus avoiding absorption such as may occur with plastics). (Bopp-ORNL) W72-12196

PREDICTING RADIOCONTAMINATION OF PLANTS THROUGH RAIN (AND IRRIGATION WATER) (ESTIMATION DU TAUX DE TAN-

SFERT DE LA RADIOCONTAMINATION DE LA PLUIE AUX VEGETAUX), Commissariat a l'Energic Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres. J. Lehr, and C. Myttenaere.

Paper presented at the Commission of the Europe-an Communities International Symposium, Radioecology Applied to the Protection of Man aand His Environment, Rome, Sept. 1971. 23 p, 5

Descriptors: *Irrigation water, *Nuclear wastes, *Fallout, *Agronomic crops, Water pollution effects, Path of pollutants, Soil-water-plant relationships, Radioecology, Strontium radioisotopes, Systems analysis, Reviews, Food chains. Identifiers: Cesium radioisotopes.

Research on predicting radiocontamination of plants through rain and irrigation is reviewed. Radionuclide uptake from irrigation water varies more directly with the quantity of contaminants delivered than uptake by the leafy parts by interception of rainwater, where there is an inverse dependence on the time of delivery. A 2-3 mg Ca content of rainwater reduces Sr-90 uptake to 1/2 that from demineralized water. Littake into cereal that from demineralized water. Uptake into cereal foods is particularly sensitive to climatic conditions at the time of maturation of the plants, and may exceed that into leafy vegetables and green forage. (Bopp-ORNL) W72-12197

A MATHEMATICAL MODEL FOR EVALUA-TION OF RADIOACTIVE AND CONVEN-TIONAL POLLUTION OF SURFACE WATERS (MODELLO MATEMATICO PER LA VALU-TAZIONE DI INQUINAMENTI RADIOATTIVI E CONVENZIONALI IN ACQUE SUPERFICIALI). Comitato Nazionale per l'Energia Nucleare, Rom (Italy); and European Communities, Luxembourg.

Commission.
F. Brauca, F. Breuer, A. A. Cigna, and R. Amavis.
Paper presented at the Commission of the European Communities International Symposium,
Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 31 p, 4

Descriptors: Strontium radioisotopes, *Potable water, *Irrigation water, *Nuclear wastes, Radioecology, Europe, Path of pollutants, Water pollution effects, Water pollution control, Public health, Vegetable crops, Milk, Systems analysis, *Mathematical models, Absorption, Sediments, Sediment transport, Flocculation, *Model studies. Identifiers: *Cesium radioisotopes, *Ruthenium radioisotopes

The internal dose to man from environmental contamination by reactor effluents is calculated using a compartmental model. Critical radionuclides and critical populations are Cs-137 for infants, Ru-106 for adults, and Sr-90 for both. Considering the pathways via drinking and irrigation water; the capacity of a river, with a flow of 100 cubic mecapacity of a river, with a flow of 100 cubic meters/sec and carrying 30 kg/sec of sediment, is 7.2 Ci/year of Cs-137, 0.22 Ci/year of Sr-90, and 200 Ci/year of Ru-106. (It is assumed that drinking water will be treated by flocculation with aluminum sulfate.) Planning of research in the field of chemical pollution may be facilitated using an analogous model. (Bopp-ORNL)

Group 5B—Sources of Pollution

HAZARD POTENTIAL OF RADIOACTIVE

Comitato Nazionale per l'Energia Nucleaire, Rome (Italy); and Oak Ridge National Lab., Tenn. F. Gera, and D. G. Jacobs.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Enivronment, Rome, Sept. 1971, 17 p, 1

Descriptors: *Radioactivity, *Environment, *Radioactive wastes, *Hazards, *Evaluation, Estimating, Forecasting, Assessments, Air pollu-tion, Water pollution, Water pollution sources, Toxicity, *Path of pollutants, Food chains, Radioisotopes, Radioecology. Identifiers: Hazards analysis, *Prediction, Radia-

Concern has been expressed about the possible levels of contamination of the environment as a consequence of radionuclide releases, either intentional or accidental. A uniform method to evaluate the potential hazard associated with the existence of a certain amount of radioactive material might of a certain automotive to be useful. In order to permit the evaluation and the comparison of global hazards, the use of the Potential Hazard Index (PHI) is proposed. The hazard associated with radioactive materials is a function of the amount of activity, of the radiotoxicity of the nuclides and of the probability that human beings will be exposed to the radiation emitted by the radioactive nuclides. Quantitative information about environmental transfer processes and about the reliability of the long-term containment of radioactive wastes is necessary for adequate assessment of values for P. Some situations are reviewed for which possible ranges of P can be estimated. (Houser-ORNL) W72-12199

PROBLEMS IN THE EVALUATION OF THE RADIOLOGIC RECEPTOR CAPACITY OF THE ENVIRONMENT - GENERAL METHOD OF AP-PROACH (PROBLEMES POSES PAR L'EVALUATION DE LA CAPACITE RADIOLOGIQUE LIMITE D'UN MILIEU RECEPTEUR - PRINCIPES GENERAUX D'AP-

PROCHE, Commissariat a l'Energic Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres.

Paper presented at the Commission of the European Communities Internation Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 11 p, 5

Descriptors: *Systems analysis, *Nuclear wastes, *Water pollution control, *Fallout, Radioecology, Environmental effects, Radioactivity, On-site investigations, Forecasting, Mathematical models, Public health, Path of pollutants, Streams, Sedimentology, Oceans, Lakes.

On-site studies are necessary since complex parameters are involved (the physicochemical properties of the various radionuclides; effects of environmental parameters on rates of dilution, dispersion, and immobilization; the prevalence in the area of agriculture, industry, and recreation; and dietary habits of the population). Important parameters are discussed very briefly for: gaseous effluents ((1) meteorological conditions favoring dispersion, (2) those favoring fallout or rainout, (3) type of local agriculture, and (4) dietary habits), streams ((1) dilution, (2) fixation of radioisotopes on suspended particles and in biota-related sediments, and (3) the eventual steady-state contamination at the outfall), lakes, oceans, and soil contamination. (Bopp-ORNL) W72-12201 RADIOECOLOGY AS AN AID TO THE GENERAL ENVIRONMENTAL POLLUTION PROBLEM,

Volksgezondheid, voor Bilthoven (Netherlands). Environmental Sanita-

J. Spaander, and L. Strackee. Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971, 12 p, 7

Descriptors: *Environment, *Air pollution, *Water pollution, *Water pollution sources, *Nuclear explosions, Fallout, Transport, Oceans, Lakes, Rivers, *Radioecology, Radioactive waste disposal, Path of pollutants, Radioactive tracers, Ecology.

Identifiers: Critical nuclide, Critical nuclide

Except for pollution problems which bear a typical local character, the general solution of the problems can not be restricted to the territory of single countries or a small group of countries. The safeguarding of the waters of the large rivers and seas in Europe is in most cases a matter of international deliberation. The protection of the oceans against unacceptable pollution will require negotiations on a mondial level. The world-wide extent of the pollution problem was demonstrated first and most clearly on a mondial scale when the fatal results of the testing of nuclear weapons in the free atmosphere became manifest. Discussions are given relative to the pollution problem in the philosophy of waste disposal, the radioecological approaches, the critical pathway concept and its limitations, the use of radioactive tracers in ecological studies, and the interaction of different pollutants. (Houser-ORNL) W72-12202

FIXATION OF SR, ZN AND CE RADIONUCLIDES BY SODIUM ALGINATE AND ALGINIC ACID FROM SEA WATER, Institute of Biology of the Southern Seas,

Sevastopol (USSR). G. E. Lazorenko.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 8 p, 5 fig, 5 ref.

Descriptors: *Marine algae, *Strontium radioisotopes, *Zinc radioisotopes, Absorption, Sedimentation, Analytical techniques, Molecular structure, Cation exchange, Radioecology, *Path of pollutants.
Identifiers: *Cerium radioisotopes.

Sedimentation and light scattering showed that sodium alginate obtained from Black Sea Sodium aignate obtained from black Sea Cystoseira has two molecular weight fractions, 800,000 and 37,000. Ion exchange studies showed that Zn is bound by only the lower, Ce is bound to a greater extent by the higher, and Sr is bound by both. (Bopp-ORNL) W72-12203

EXPERIMENTAL STUDY OF TH ISOTOPES ACCUMULATION BY MARINE ORGANISMS, Institute of Biology of the Southern Seas,

Sevastopol (USSR).

A. B. Nazarov, and A. Ya. Zesenko.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 9 p, 4 fig,

Descriptors: *Radioisotopes, *Marine algae, *Absorption, *Mine wastes, Radioecology, *Path of pollutants, Physicochemical properties. Identifiers: Thorium radioisotopes.

To determine the role of marine organisms in migration of Th in mine wastes, uptake was stu-died by four species of algae from seawater con-taining oxalic and hydrochloric Th compounds. Possible reasons for differences between the concentration factors found and literature values are: (1) under natural conditions the time of algae conthe mater natural conditions the time of algae contact with sea water is considerably more than in the present experiment, (2) the possible existence of regions of the ocean with high Th concentration, and (3) difference in the physicochemical state. (Bopp-ORNL)

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A CUMULATIVE EXPOSURE INDEX (CUEX) FOR ASSESSING ENVIRONMENTAL RELEASES OF RADIOACTIVITY, Oak Ridge National Lab., Tenn.

S. V. Kaye, R. S. Booth, P. S. Rohwer, and E. G. Struxness.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 12 p, 3 fig. 4 ref.

Descriptors: *Radioactivity, *Measurement, *Atmosphere, *Air pollution, Water pollution, *Soil contamination, *Environment, Water pollution sources, Radioecology, Human population, Food chains, Assay, Bioassay, Evaluation, Public health, Toxicity. Identifiers: Dose, Dose calculation.

The Cumulative Exposure Index (CUEX) is being developed to facilitate efficient realistic assessment of environmental releases of radioactivity. The aim of CUEX is to assess the release on the basis of time-integrated radionuclide concentra-tions measured in suitable environmental sampling media. Typical measurements would be concentrations of radioactivity in air or water or on the land surface. The measured concentrations are assessed against basic radiation safety standards recommended for members of the public by recognized authorities. Because the recommended standards dards are expressed in units of dose (rem), the CUEX index, of necessity, embodies environmen-tal models and dose models to convert the measured environmental radionuclide concentrations into estimates of radiation dose to man. The final estimates of radiation dose to man. The final estimate of dose and dose commitment used in calculation of CUEX includes contributions for each radionuclide and exposure mode of significance, and is compared to the appropriate radiation dose limit to complete the assessment. (Houser-ORNL) W72-12205

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L-'INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969),

Padua Univ. (Italy). Instituto di Igiene. G. G. Calapaj, and D. Ongaro. Minerva Fisiconucl. Vol 14, No 4, p 202-212, Oct-Dec 1971. 4 fig, 3 tab, 12 ref.

Descriptors: *Survey, Water pollution, *Lagoons, *Radioisotopes, Water pollution sources, *Strontium, *Cesium, Manganese, Food chains, Mollusks,

A survey of the radioactive contamination from 90Sr, 137Cs and 54Mn of 12 edible species of molluses and crustaceans of the Venice Lagoon, was carried out from 1964 to 1969. An estimate of the concentration of these radioisotopes in the surrounding water was also attempted, based on their levels in those mulluscs whose concentration factor (c.f.) was known from the literature. For the c.f. of 90Sr and 137Cs the lowest values, 0.6 and 6.0 respectively, found in the literature for genera normally living in the Lagoon have been assumed. The c.f. for 54 Mn had to be estimated from aquarium experience. The mollusc Pinna nobilis still living in the Venice Lagoon, whose characteristic of accumulating the 54Mn from the environment was already known through previous work was chosen as the critical animal. (Houser-ORNL) W72-12206

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CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT, OCT. 1 TO DEC. 31, 1971; BIOLOGY AND HEALTH PHYSICS DIVISION; ENVIRONMENTAL RESEARCH BRANCH, Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.

Available from NTIS, Springfield, Va. as AECL-4154, \$3.00 paper copy; \$0.95 microfiche. In: Report PR-B-92 (AECL-4154), p 57-79. March 1972. 3 fig, 30 ref.

Descriptors: *Radioactivity, *Monitoring, *Radioisotopes, *Nuclear wastes, Radioactivity techniques, Technology, Fish, Animal physiology, Absorption, Pesticide residues, Tritium, *Path of pollutants, Water pollution sources, Neutron activation analysis, Tracers, Trace elements, Water analysis, Water balance, Lakes, Canada, Cores, Sediments, Analytical techniques, Cobalt radioisotopes, Strontium radioisotopes, Nutrient cycling, Aquatic life, Soil-water-plant relationships, Crops.

Radioactivity monitoring of on-site surface waters and the Ottawa River, and Perch Lake studies (see W72-03334) continued. The specific activity of Sr-90 in the upper 10 cm of lake sediments indicated incomplete exchange with the water after 15 years exposure. About 30% of the Co-60 entering the exposure. About 30% of the Co-60 entering the lake was retained in the upper few cm of sediments. To correlate sedimentation rates with radionuclide profiles, analytic separations were developed for Zr, Th and Ce; but more work is required for Sr. Evaporation (10 cm for July) was estimated from tritium in water and vapor using mathematical models. Uptake of Co-60 by crops was relatively low for peat and organic-sludge soils (contrasting with Cs uptake). Uptake by aquatic life was affected by morphology, water currents, and fish feeding habits. In studies of nutrient and radionuclide uptake in lakes, large plastic cylinders were used to isolate volumes of plastic cylinders were used to isolate volumes of the water. Sr uptake may be a sensitive detector of small sub-lethal, pesticide-induced disturbances in fish metabolism. Sr discrimination varied between fish species, was almost unaffected by environ-mental factors, and was less for uptake via the gut than via the gills. Rhodamine B tracer indicated small affect of the Glaverbel wharf on flow patterns past the Gentilly nuclear powerplant. (Bopp-ORNL) W72-12207

RADIOACTIVITY IN SURFACE AND COASTAL

WATERS OF THE BRITISH ISLES, 1970, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

Available from NTIS, Springfield, Va. as FRL-8, \$3.00 paper copy; \$0.95 microfiche. Fisheries Radiobiological Laboratory Report 8, Dec. 1971,

Descriptors: *Monitoring, *Aquatic environment, *England, *Radioactive waste disposal, *Effluents, Public health, Toxicity, Nuclear power-plants, Water pollution, Water pollution sources, Fallout, Background radiation, Path of pollutants, Radioisotopes, Water pollution control. Identifiers: Wales, England, Radiation safety,

Radiation control.

This is the fifth in an annual series of reports presenting the work of monitoring the aquatic en-vironment by the Fisheries Radiobiological Laboratory, and it describes surveys made during 1970. Most of the laboratory's effort in this field is

directed to fulfilling the Ministry's responsibilities in the control of radioactive waste discharges -that is, in England and Wales - and much of the in-formation refers to these areas. Those establish-ments discharging liquid radioactive waste are listed in a table, which also includes a summary of the important factors in the critical exposure pathways. The quantities of radioactivity which each of these sites is permitted to dispose of are listed, with the percentage utilized alongside. The authorized limit is never allowed to exceed the limiting environmental capacity and for many disposals the quantities involved are only a very small proportion of it. Most of the data have been produced to demonstrate the radiological safety of environmental contamination. In addition to this environmental contamination. In addition to this basic work, research results are included - espe-cially where they contribute to a better un-derstanding of the extent and significance of the effects of particular disposals. This comprehen-sive monitoring of the environment confirms that adequate control of radioactive waste disposal has been maintained throughout 1970. (Houser-ORNL) W72-12208

RADIONUCLIDE DISTRIBUTION IN COLUM-BIA RIVER AND ADJACENT PACIFIC SHELF SEDIMENTS.

Oregon State Univ., Corvallis. Dept. of Oceanog-

Available from NTIS, Springfield, Va. as RLO-1750-49, \$3.00 paper copy; \$0.95 microfiche. RLO-1750-49, 1970, 59 p.

Descriptors: *Nuclear powerplants, *Effluents, *Water pollution, Water pollution sources, *Radioactive waste disposal, *Columbia River, Ecosystems, Sediment distribution, Pacific Ocean, Biota, Plankton. Identifiers: Radiation safety and control.

Ideas of interest in radiogeological investigations of the Columbia River basin are presented. Much information is available from a wide range of tracer studies in this tagged ecosystem. Concern is expressed about the mechanisms operating to change the system by both artificial and natural processes. Studies have been made and are expected to continue to elucidate the complex pathways the radionuclides from Hanford's ar reactors take as they move downstream, continually mixing with the water and being sorbed on biota and sediments. The relationships between the radionuclides and their environment are discussed. (Houser-ORNL) W72-12209

NON-BIOLOGICAL UPTAKE OF ZINC-65 FROM A MARINE ALGAL NUTRIENT MEDI-UM,

Oregon State Univ., Corvallis. For primary bibliographic entry see Field 05A. W72-12210

VERTICAL DISTRIBUTION OF RADIOACTIVI-TY IN THE COLUMBIA RIVER ESTUARY, Oregon State Univ., Corvallis. Oregon P. J. Hanson.

Available from NTIS, Springfield, Va. as RLO-1750-80, \$3.00 paper copy; \$0.95 microfiche. RLO-1750-80, June 1967, 86 p.

Descriptors: *Radioactivity, *Effluents, *Radioactive wastes, *Nuclear powerplants, *Estuarine environment, *Columbia River, Vertical migration, Depth, Temperature, Radioisotopes, Sampling, Analytical techniques, Assay, Mass spectrometry, Radiochemical analy-Identifiers: Hanford site.

In situ salinity, turbidity and temperature were measured at discrite depths, and water samples for radioanalysis were simultaneously collected in the Columbia River Estuary using a specially designed instrument package. Particulate radioactivity was concentrated by filtration and the dissolved discretifiate by appropriate or ferric oxide bulk concentrated by filtration and the dissolved radioactivity by evaporation or ferric oxide bulk precipitation. Radioanalysis was by gamma-ray spectrometry and data reduction by computer. Chromium-51 was mostly dissolved and conservative in brackish water, while zinc-65 was mostly particulate and non-conservative. The intrusion of salt water into the estuary was seen to greatly increase the concentrations of particulate chromium-51, and zinc-65 and scandium-46 near the bottom. The fall and rise in estuarine radioactivity levels were followed during an infrequent pause in Hanford reactor operations. (Houser-ORNL) W72-12211

SEASONAL CHANGES IN PARTICLE SIZE DISTRIBUTION COMPOSITION, AND STRONTI-UM EXCHANGE CAPACITY OF PARTICU-LATE MATTER SUSPENDED IN THE COLUM-

BIA RIVER, Battell Pacific Northwest Labs., Richland. Wash. R. E. Wildung, R. C. Routson, and R. L. Schmidt. Available from NTIS, Springfield, Va. as BNWL-1638, \$3.00 paper copy; \$0.95 microfiche. Report BNWL-1638, Jan. 1972, 32 p.

Descriptors: Water pollution, Water pollution sources, *Effluents, *Radioactive wastes, *Columbia River, *Particle size, Suspended load, Distillation, Ion exchange, Separating techniques, Activated carbon, Strontium, *Seasonal, Distribu-Identifiers: *Periodicity, Seasonal cycling.

A centrifugation method was employed to frac-tionate, according to equivalent spherical diame-ter, particulate matter suspended in the Columbia River during November, February, April, June and August. The isolated size fractions were characterized as to particle size distribution, car-bon content, predominant primary and secondary minerals and strontium exchange capacity. The results were related to watershed characteristics and seasonal changes in river conditions. (Houser-ORNL)

HORIZONTAL AND VERTICAL DISTRIBU-TIONS OF RADIONUCLIDES IN THE NORTH PACIFIC OCEAN,
Battelle Pacific Northwest Labs., Richland, Wash.

Journal of Geophysical Research, Vol. 77, No. 6, p 1061-1070. Feb. 20, 1972, 4 fig, 3 tab.

Descriptors: "Radiation, "Radioactivity, "Profiles, "Stratification, "Gradients (Streams), "Pacific Ocean, Diffusivity, Diffusion, Sampling, Water pollution, Assay, Surface waters, Fallout. Identifiers: Beryllium, Zirconium, Niobium, Pubberium, Carium, Profilement (Street, Pro Ruthenium, Cerium.

Concentrations of 7Be, 95ZrNb, 106Ru, and 144Ce were determined in surface water and vertical profiles in the North Pacific Ocean. Latitudinal distribution of radionuclides in equatorial waters differed from previous patterns of both terrestrial and oceanic fallout of long-lived fission products. Fallout rates were quite uniform across narrow latitude belts, with constant amounts of radionuclides occurring both vertically and horizontally in the water mass. The short-lived radionuclides were uniformly distributed in the mixed layer, but decreased in concentration as the mixed layer, but decreased in concentration as the thermocline was penetrated. Vertical eddy diffusion coefficients, calculated from 7Be and 95ZrNb sion coefficients, calculated from 7Be and 952rNb data, were 0.5-0.7 cm2/sec within the upper boundary of the main oceanic thermocline. Concentration data of the various locations sampled are given in tabular form. (Houser-ONRL) W72-12213

Group 5B-Sources of Pollution

CONCENTRATION OF IRON-55 IN COMMERCIAL FISIS SPECIES FROM THE NORTH AT-

LANTIC,
Ministry of Agriculture, Fisheries and Food,
Lowestoft (England). Fisheries Radiobiological Lab.

Marine Biology, Vol. 6, No. 4, p 345-349, Aug. 1970, 1 fig, 4 tab, 24 ref.

Descriptors: "Nuclear explosions, "Civil defense, *Fallout, "Aggradation, "Atlantic Ocean, Fish, Food chains, Human population, Public health, Water pollution, Iron, Water pollution sources. Identifiers: Deposition, Cod fish, North Atlantic

Concentrations of the weapon-test, fallout radionuclide iron-55 have been reported for migrafallout tory species, such as the Pacific salmon, which suggest a marked decrease in concentration with decrease in latitude of the point of capture. This situation has been examined for North Atlantic cod stocks in order to provide data for a species representative of a large geographical area, but di-vided into more or less distinct stocks each with a restricted territory, in order to provide further data on the importance of latitude in determining iron-55 concentrations. The data obtained show iton-3 concentrations. In each observed when there is a marked dependence upon latitude, Arctic cod averaging 90 pCi 55Fe/mg Fe compared with 15 pCi 55Fe/mg Fe for cod from middle latitudes. (Houser-ORNL) W72-12214

EXCESS-RADON AND TEMPERATURE PROFILES FROM THE EASTERN EQUATORI-AL PACIFIC.

Scripps Institution of Oceanography, La Jolla, Calif

Yu-Chia Chung, and H. Craig. Earth and Planetary Science Letters, Vol 14, p 55-64, 1972, 6 fig, 2 tab.

Descriptors: *Profiles, *Stratification, *Gradients (Streams), *Radioisotopes, *Temperature, *Water temperature, *Pacific Ocean, Measurement, Model studies, Correlation analysis, Diffusivity,

Identifiers: *Radon.

A series of excess-radon and continuous temperature profiles in bottom water of the eastern equatorial Pacific was measured on SCAN Expedition. The results show that the temperature profiles have many characteristics which correlate with the radon profiles and provide important information on the nature of the bottom water processes. Highest model diffusivities for radon were en-countered in regions where the temperature gradient was adiabatic; in constant diffusivity models these parametric values are about 200 cm2/sec, as compared with more generally ob-served values which are a factor of 10 lower. Four types of radon profiles are described; quasi-exponential, layered, cascade-type, and cusp-type profiles. The results of the model calculations are summarized. It is apparent that the simultaneous measurement of continuous temperature profiles with excess radon in bottom water will considerably enlarge the understanding of the mixing processes just above the sea floor. Results of the initial study indicate the describidation. initial study indicate the desirability of (1) making temperature and radon measurements on a single cast, and (2) adding measurements of suspended material in the water. (Houser-ORNL.) W72-12215

SOME ASPECTS OF WATER MOVEMENT

THROUGH SOILS, Agricultural Research Council, Cambridge (England). Unit of Soil Physics.

E. G. Youngs.

B. G. Toungs. In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 107-119. 5 fig, 18 ref.

Descriptors: *Soil water movement, *Mathematical models, *Percolation, *Hydraulic conductivity, Irrigation water, *Path of pollutants, Environmental effects, Deep percolation, Canal seepage.

Darcy's law for the flow of water through porous materials may be applied to obtain the flowpaths, and also the distribution of water content in unsaturated materials. As an example, the flow to great depths from irrigation channels is considered. When soils overlie a horizontal impermeable bed, the horizontal seepage may be obtained by solving Poisson's equation in order to obtain the integral of the product of hydraulic conductivity and soil-water pressure over the height, the gradient of which is the seepage rate at a given position. Boundary conditions between two porous materials explain the steady-state occurrence of wet soil in contact with a drier soil of coarser texture. Microscopic considerations must often replace the macroscopic approach which can only give an average flow path. (Bopp-ORNL) W72-12216

SOME PROBLEMS IN THE DIFFUSION OF

Oxford Univ. (England). Soil Science Lab.

In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 120-134. 4 fig, 38 ref.

Descriptors: *Reviews, *Diffusion, *Simulation, *Ion transport, Soil water movement, Mathematical models, Convection, *Path of pollutants, Sorption, Percolation.

Methods of measuring and calculating diffusion coefficients are reviewed. No clear evidence has yet been found of important diffusion of adsorbed ions in soils. Problems of finding isotherm slopes due to adsorption hysteresis, exchange capacity saturation and electrolyte concentration changes are discussed. Solutions of the diffusion equation are available for simple systems, but concentra-tion-dependent diffusion coefficients, irregular boundary conditions or convection with diffusion will usually require numerical solutions. An analogue method has been used to deal with nonsymmetrical arrangements in space. (Bopp-ORNI.) W72-12217

CATION EXCHANGE IN SOILS, Louvain Univ. (Belgium). Laboratoire Chimie H. Laudelout.

In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 33-39. 11 ref.

Descriptors: *Soil properties, *Ion exchange, *Physicochemical properties, *Thermodynamic behavior, Reviews, Mathematical models, *Path of pollutants, *Soil contamination, *Cation of pollutants,

Preliminary data indicate the thermodynamically expected relation between the activity of soil water and the ion-exchange selectivity (a parameter analogous to an equilibrium 'constant'). Although the thermodynamic method can predict the exchange reactions between two ions if that of each with a common ion is known, a systematic study in a given soil exchange complex has not been made. Unless the reversibility of the exchange reaction has been demonstrated, the thermodynamic formulation is limited to values obtained from extrapolating the experimental results to vanishing ionic strength. It has been observed for all exchanges studied that Scatchard's formulation of the excess free energy of mixing is satisfied at a sufficiently low temperature. (Bopp-ORNL) W72-12218

SORPTION AND TRANSPORT IN SOILS, Instituut voor Toepassing van Atoomenergie in de Landbouw, Wageningen (Netherlands). M. J. Frissel, P. Poelstra, and P. Reiniger. In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 135-149. 12 fig, 1 tab, 5 INVES GRANI Idaho U H. R. S

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Descriptors: *Fallout, *Soil water movement, *Ion transport, *Strontium radioisotopes, *Path of pollutants, *Simulation, Mathematical models, Diffusion, Sorption, Transfer, Percolation, Pesticide kinetics, *Model studies.

The importance of various parameters of a simula in amportance of various parameters of a simula-tion model for the migration of Sr-90 fallout in pastures was evaluated by comparison with mea-surements at various locations in the European Community. When a profile of 40 cm depth was represented by 2 cm thick layers, doubling the layers was insignificant compared with experimental variations. Transfer rates between subsequent layers were computed for a time interval small enough to permit a given accuracy, repeating until the end of the simulated period. An apparent diffu-sion coefficient was derived by combining the variables moisture content, tortuosity, diffusion coefficient in water, dispersion coefficient and water flux. Ploughing increased the rate of transfer to deeper layers. (Bopp-ORNL) W72-12219

AN ESTIMATE OF MORTALITY OF CHINOOK SALMON IN THE COLUMBIA RIVER NEAR BONNEVILLE DAM DURING THE SUMMER RUN OF 1955, Bureau of Commercial Fisheries, Auke Bay,

Alaska. Biological Lab. For primary bibliographic entry see Field 05C. W72-12250

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND, NEW YORK,

Geological Survey, Washington, D.C. E. J. Pluhowski.

Available from GPO, Washington, D.C. 20402 -Price \$0.30 cents. Geological Survey Water-Supply Paper 2009-B, 1972. 20 p, 13 fig, 8 ref.

Descriptors: *Remote sensing, *Infrared radia-tion, *New York, *Hydrogeology, *Data collec-tions, Thermal pollution, Discharge (Water), Water pollution sources, Water circulation, Ice Identifiers: *Long Island (NY).

Six remote-sensing flights over Long Island's north and south shores were made during the period July 13, 1967, to February 25, 1970. In-frared imagery in the 8- to 14-micrometer range was obtained; results varied from poor to excellent. The ability of the imagers to discern thermal contrasts of as little as 1 deg to 2 deg C permitted identification of areas of heavy groundwater discharge. These areas were concentrated primarily along the eroded headlands of the north shore and in the lower reaches of watercourses draining into Great South Bay. Only a few highly localized examples of direct groundwater discharge into the embayments along Long Island's south shore were detected in the imagery. Thermal loading emanating from a powerplant near Oceanside is quickly dissipated in Middle Bay. Infrared imagery may also be used to identify circulation patterns, ice cover, changes in stream-temperature regimen, and the location of sewer outfalls. Optimal time for the collection of infrared imagery for hydrologic studies on Long Island is in summer and in winter, when surface-water thermal differences are relatively large. (Knapp-USGS) W72-12373

INVESTIGATION OF A LANDFILL IN GRANITE-LOESS TERRANE, Idaho Univ., Moscow. Dept. of Civil Engineering. H. R. Seitz, A. T. Wallace, and R. E. Williams. Ground Water, Vol 10, No 4, p 35-41, July-August 1972. 9 fig, 2 tab, 3 ref.

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Descriptors: *Landfills, *Water pollution sources, *Idaho, *Leaching, Infiltration, Path of pollutants, Groundwater movement, Hydrogeology, Loess, Identifiers: *Moscow (Idaho).

The hydrogeologic environment adjacent to the sanitary landfill used by the city of Moscow, Idaho, was investigated in an attempt to identify the factors contributing to its alteration and to the reported alteration of groundwater downgradient from the fill. The refuse disposal trenches cut from the fill. The refuse disposal trenches cut through loess and penetrate weathered granite. The major aquifer in the area is the weathered granite underlying the loess, particularly in draws. Surface water quality is slightly degraded and shallow groundwater is slightly contaminated. However, there is no serious widespread pollution of groundwater by the landfill. Electrical resistivity was tested as a means of detecting leachate from landfills in this type of environment. Comparison of resistivity data with water quality data showed that the technique is satisfactory, provided traverses are nearly horizontal. (Knapp-USGS) W72-12378

APPLICATION OF THE FINITE ELEMENT METHOD TO REGIONAL WATER TRANS-PORT PHENOMENA, Alaska Univ., College. Inst. of Water Resources. G. L. Guymon, and I. P. King. In: Sparse Matrices and Their Applications; Plenum Press, New York, D. J. Rose, and R. A. Willoughby editors, p 115-120, 1972. 2 fig. OWRR A-036-ALAS (1).

Descriptors: *Finite element analysis, *Numerical analysis, *Path of pollutants, Streams, Lakes, Reservoirs, Rivers, Deltas, Estuaries, Oceans, Simulation analysis, Mathematical models.

A mathematical model based on the finite-element method is capable of simulating or predicting the movement and fate of pollutants in large freshwater lakes or reservoirs. A physical, or hydrodynamic, description of the water body is es-sential because the chemical and biological processes are dependent on the temporal and spa-tial flow field. The hydrodynamic state of the system must be known before the chemical-biological phenomena can be predicted since they are defined in terms of the hydrodynamic state of the system. Equations approximate bulk fluid move-ment and transport of discrete species in the horizontal plane. Similar equations can be written to solve the problem in the vertical plane. Thus a quasi-three-dimension solution may be obtained quasi-mice-dimension solution may be obtained by a suitable meshing of the two different solu-tions. The variational principle technique used consists of finding an equivalent variational princi-ple to the given differential equation system. The trial expansion function in the Galerkin method and in the minimization of the variational principle is systematically found by the finite element method. (See also W72-11866) (Knapp-USGS) W72-12381

5C. Effects of Pollution

SOME DISTINCTIVE FEATURES OF AUS-TRALIAN INLAND WATERS, Monash Univ., Clayton (Australia). Dept. of

Zoology. W. D. Williams, and Fong Wan Hang. Water Research, Vol 6, No 7, p 829-836, July 1972,

Descriptors: *Water chemistry, *Water quality, *Australia, Ecology, Salinity, Sodium, Chlorides, Phosphates, Stratification, Lakes, Limnology, Streamflow, Water temperature, Thermal stratifi-

Some distinctive features of Australian inland waters are discussed for possible use for water pollution control agencies. The distinctive features include: (a) the inapplicability of the concept of a standard composition for average fresh water; (b) the predominance of sodium and chloride ions in fresh waters; (c) the high proportion of saline bodies of water; (d) the high concentration of phospate in many lakes and reservoirs; (e) the absence of dimictic lakes, the presence of warm monomicic lakes, and the occurrence of an arabsence of dimictic lakes, the presence of warm monomictic lakes, and the occurrence of an apparently unique thermal pattern in some highland lakes; (f) the pronounced seasonal and secular fluctuations in discharge of rivers; (g) the high faunal endemicity; and (h) the possible effects on the ecology of stream biotas of the absence of a well-defined seasonal terrestrial leaf fall. (Knapp-USGS) W72-11742

SALINITY AND THE WHOLE ANIMAL, Adelaide Univ. (Australia). Waite Agricultural

Research Inst.
For primary bibliographic entry see Field 03C.
W72-11765

SALINITY AND ANIMAL CELLS, New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology. For primary bibliographic entry see Field 03C. W72-11766

SALINITY AND THE WHOLE PLANT, Adelaide Dept. of Agriculture (Australia). For primary bibliographic entry see Field 03C. W72-11767

SALINITY AND PLANT CELLS, Sydney Univ. (Australia). School of Biological For primary bibliographic entry see Field 03C. W72-11768

EFFECTS OF THE USE OF AGRICULTURAL PESTICIDES ON WATER POLLUTION, State Coll. of Agronomical Science, Gembloux

(Belgium). P. Martens.

Ann Gembloux. Vol 77, No 1, p 39-47. 1971. Identifiers: *Water pollution sources, Agriculture, *Pesticides, Runoff, Spraying.

While in terms of volume agricultural chemicals are not the most serious pollutants, their inherent are not the most serious pollutants, their inherent toxicity more than compensates for any lack of volume. These chemicals may enter the water from aerial spraying or from runoff from farm lands. This is a problem in all areas of the world but it is perhaps most damaging in the USA where more of these chemicals are used. It is felt that strict regulations may be needed to protect the waterways from such contamination. Some of the chemicals involved are 2,4-D, DDT, aldrin, and lindane.—Copyright 1972, Biological Abstracts, Inc. Inc. W72-11788

DISTRIBUTION AND ABUNDANCE OF PLANK-TONIC CRUSTACEA IN STURGEON BAY AND SHAWANAGA INLET, GEORGIAN BAY, ON-

TARIO, Waterloo Univ. (Ontario). Dept. of Biology. For primary bibliographic entry see Field 02L. W72-11795

GROWTH RATE OF ASPIDISCIDAE ISO-LATED FROM ACTIVATED SLUDGE, Tokyo Univ. (Japan). Inst. of Applied Microbiolo-

gy. R. Sudo, and S. Aiba. Water Research, Vol. 6, No. 2, p 137-144, Februa-ry 1972. 2 fig, 2 tab, 21 ref.

Descriptors: "Activated sludge, "Protozoa, "Growth rates, Cultures, Isolation, Food habits, Biochemical oxygen demand, Chemical oxygen demand, chemical oxygen demand properties, Thermal properties, Chemical properties, Waste water

treatment. Identifiers: *Aspidisca costata, *Aspidisca lynceus, Activation energy, Monoxenic cultures, Enrichment, Paramecium caudatum, Culture media, Vorticella convallaria, Vorticella alba, Vorticella microstoma, Epistylis, Carchesium polypinum, Aspidisca spp., Loxophyllum spp. Litonotus, Amoeba spp., Arcella vulgaris, Astasia, Bodo edax, Pleuromonas, Oikomonas terma, Peranema, Tokophrya spp, Podophrya, Philodina roseola.

Isolation, stock and monoxenic culturing of two species of Aspidiscidae, Aspidisca costata and Aspidisca Iynecus, have been successfully accomplished. Aspidiscidae are the typical protozoa found frequently in the activated sludge from mucipal sewage treatment. Using a heterogeneous bacterial population isolated from the activated sludge as the protozoan food, the monoxenic growth rate (logarithmic growth phase) of Aspidiscidae and the effect of temperature on the growth rate were measured. The specific growth rate was 1.2-1.3/day at 20 C, about one-half of that observed with Vorticellidae at the same temperature. Aspidiscidae examined were 'stenphagic' and 'horozoic'. The optimum temperature for growth was about 30 C and the value of activation energy for growth was delta E equals 13,800 cal/mole. (Mackan-Battelle)

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY, National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. For primary bibliographic entry see Field 05A. W72-11797

MARINE ALGAE OF THE SMITHSONIAN-BREDIN EXPEDITION TO YUCATAN-1960, Michigen Univ., Ann Arbor. Dept. of Botany. For primary bibliographic entry see Field 05A. W72-11800

GEOGRAPHIC DISTRIBUTION AND RELATIVE ABUNDANCE OF SALPIDAE OFF THE OREGON COAST, Oregon State Univ., Corvallis. Dept. of Oceanog-

For primary bibliographic entry see Field 05A. W72-11806

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN, Wisconsin Univ., Madison. Water Chemistry Lab. For primary bibliographic entry see Field 05B. W72-11809

ACCUMULATION OF METHANOGENIC SUB-STRATES IN CC14 INHIBITED ANAEROBIC SEWAGE SLUDGE DIGESTER CULTURES, Union Coll., Schenectady, N.Y. R. M. Sykes, and E. J. Kirsch. Water Research, Vol. 6, No. 1, p 41-55, January 1972. 9 fig, 3 tab, 20 ref.

Descriptors: *Methane, *Sewage sludge, *Inhibition, *Methane bacteria, *Anaerobic digestion,

Group 5C-Effects of Pollution

Hydrogen, Organic compounds, Carbohydrates, Fermentation, Anaerobic bacteria, Sludge digestion, Anaerobic conditions, Growth rates, Biodegradation, Nutrients, Gas chromatography, Carbon, Organic acids, Cellulose, Oxygen, Nitrogen, Hydrogen ion concentration, Proteins, Limiting factors, Chlorides, Waste water treat-

Identifiers: *Substrates, *Carbon tetrachloride, Culture media, Accumulation, Acetate, Propionate, Valerate, Caproate, Glucose, Starch, Fatty acids, Isobutyrate, Butyrate, Isovalerate, Substrate utilization, Glycerol, Stearic acid.

Sources of hydrogen and its importance to anaerobic digestion of sewage sludge were studied using the CC14 inhibition of methane formation technique. Cultures were obtained from laborato ry-scale sewage sludge digesters, and both batch and fill-and-draw cultures were used. Primary sewage sludge diluted with deionized, activated carbon-treated water and buffered with NaHCO3 was used as a medium for the batch cultures. Filland-draw cultures were grown in a mixture of digesting sludge, raw primary sludge, and either glucose, starch, cellulose, protein, tripalmitin, or a mixture of glycerol and stearic acid. Gas chromatography was used to analyze for volatile fatty matography was used to analyze for volatule fatty acids and for gases. Hydrogen appeared to be evolved only from carbohydrates and its source in primary sewage sludge was apparently polymeric carbohydrates. The formation of hydrogen acetate, and propionate was inhibited by hydrogen gas. The inhibition of methane formation by CC14 stimulated the formation of valerate and caproate. Carbon recoveries in cultures supplemented with organic compounds ranges from 54 to 86 percent. This suggests that the fermentation gases and volatile fatty acids were not the only important fermentation products. Glucose, starch, and cellulose were apparently fermented by different organisms. (Mortland-Battelle) W72-11816

STANDARD ERROR OF LC 50 AND SAMPLE SIZE IN FISH BIOASSAYS, Tennessee Valley Authority, Muscle Shoals, Ala.

Div. of Environmental Research and Development. For primary bibliographic entry see Field 05A.

W72-11821

TEMPERATURE DEPENDENCY OF BIOLOGICAL DENITRIFICATION, McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering. R. N. Dawson, and K. L. Murphy. Water Research, Vol 6, No 1, p 71-83, January 1972. 7 fig, 5 tab, 22 ref.

Descriptors: *Denitrification, *Nitrogen, *Water quality control, "Nutrient removal, Temperature, Aerobic bacteria, Pseudomonas, Carbon, Nitrates, Hydrogen ion concentration, Cultures, Ammonia, Nitrites, Activated sludge, Resistance, Dissolved oxygen, Pollutant identification, Water, Chemical reactions, Kinetics, Microbial degradation, *Anaerobic digestion.

Identifiers: *Substrate utilization, Pseudomonas

denitrificans, Arrhenius temperature, Sample preparation, Culture media, Kjeldahl nitrogen.

Laboratory batch denitrification tests were conducted on defined media utilizing a dominant culture of Pseudomonas denitrificans grown under controlled temperature, pH, and dissolved oxygen levels. Pure cultures were first grown on slants of agar and inoculated onto streak plates. Scrapings were then inoculated into the same media prepared as a broth. After 48 hr of aerobic growth in a shaker bath, the contents were poured into batch reactors containing a defined medium of potassium nitrate with sodium citrate as the carbon source. The results indicated that the temperature dependence of the specific denitrification rate can

be closely approximated by an Arrhenius tempera-ture relationship. Linear nitrate and carbon removal rates obtained following an initial lag period increased with decreasing temperature. Rates ranging from 0.013 at 5 C to 0.16 mg NO3 as N/mg of organisms/h at 27 C were observed. The results of the pure culture studies were related to mixed culture reactions on activated sludge. Samples were filtered, dried, and analyzed for ammonia, total Kjeldahl, nitrates, and nitrites. Data indicated that a significant number of denitrifying microorganisms are naturally present in activated sludge. Overall denitrification rates corresponding to those of Pseudomonas denitrificans would be observed when the suspended solids wer 2.5-4.0 times those of the pure culture. The results of these studies suggest that considerable denitrifica-tion of natural waters occurs in the cold water anaerobic regions of deep lakes or beneath the ice during winter. (Mortland-Battelle) W72-11822

KINETICS OF GROWTH ON AQUEOUS-OIL AND AQUEOUS-SOLID DISPERSED SYSTEMS, Pennsylvania Univ. Philadelphia. School of

AND AQUEOUS-SOLID DISPERSED SYSTEMS, Pennsylvania Univ. Philadelphia. School of Chemical Engineering. A. E. Humphrey, and L. E. Erickson. Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 125-147, January 1972. 18 fig, 5

Descriptors: "Growth rates, "Kinetics, "Mathematical models, "Model studies, Yeasts, Cultures, Organic compounds, Lipids, Nutrient requirements, Growth chambers, Mathematical studies, Surfactants, Particle size, Drops (Fluids), Coalescence, Adsorption, Dissolved solids, Dispersion, Emulsions, Mixing, Solubility, Physical properties, Chemical properties, Bacteria, "Oil, Environment, Inhibition.

Identifiers: *Substrate utilization, Dispersed systems, Dodecene, Candida intermedia, Pichia, Brevibacterium, Candida tropicalis, Candida

Biological growth systems involving hydrocarbon fermentations act within at least 4 phases which contribute to growth. These are the gas phase (air), aqueous phase (water), dispersed phase (oil) and the solid phase (cells). Growth is affected by many factors in dispersed systems not found in single liquid phase systems. Many of these factors are presented and are considered from their mathe-matical and experimental data. Factors discussed include: (1) the mechanism of uptake in pure and non-pure dispersed systems; (2) the importance of the size, number, surface area, and distribution of oil drops; (3) distribution of the growth-limiting substrate; and (4) the variation of growth rates in relation to (a) the addition of surfactants to the dispersed system, (b) substrate concentration, and (c) temperature and agitation. The approach is based entirely upon previous literature and experimental data and upon mathematical explanations of the growth kinetics in the dispersed system. The concluding section gives consideration to the design of a continuous culture disperse system (mixing equipment). (Mackan-Battelle) W72-11832

RESPONSE OF THE ALGA CHLORELLA SOROKINIANA TO CO-60 GAMMA RADIA-

TION, Grumman Aerospace Corp., Bethpage, N.Y. Research Dept. W. F. Kunz.

Nature, Vol 236, No 5343, p 178-179, March 24, 1972. 2 fig, 11 ref.

Descriptors: *Cobalt radioisotopes, *Radiosensitivity, *Radioactivity effects, *Algae, Chlorella, Irradiation, Radioactivity techniques, Resistance, Cultures, *Chlorella sorokiniana, Co-60, Gamma

radiation, Survival, Chlorella pyrenoidosa.

The response and survival characteristics of Chlorella sorokiniana to ionizing radiation had not been determined, although the thermophilic, blue green algae had previously been used in bioregeneration studies in radiation environments. The survival of the cells to Co-60 gamma radiation was therefore measured in terms of colony-forming ability after exposing aliquots of the steek rul. ing ability after exposing aliquots of the stock culture to Co-60 radiation at an absorbed dose rate of To krad/min in fully aerobic conditions. The exposed cells were plated and incubated on glucosesupplemented Knop's agar, and scored 6 days later for visible cultures. In addition, the survivallater for visible cultures. In addition, the survival-absorption relationship was determined for 1-hr. old cells by exposure to different single doses and measuring the surviving fractions. Sublethal damage repair, repair rate, and the influence of sublethal damage repair on age and response func-tions were all tabulated. From the results it is most obvious that survival with repair is always higher than that without repair, regardless of the cell's age. Survival curves are included for all the tests. (Mackan-Battelle) W72-11836

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ISOLATION OF INFECTIOUS PANCREATIC ISOLATION OF INFECTIOUS PARCEAINE (CATASTOMUS COMMERSONI), Guelph Univ. (Ontario). Dept. of Microbiology. R. A. Sonstegard, L. A. McDermott, and K. S.

Sonstegard.
Nature, Vol 236, No 5343, p 174-175, March 24, 1972. 1 tab, 6 ref.

Descriptors: *Viruses, *Fish diseases, *Sal-Descriptors: "Viruses, "Fish diseases, "Salmonids, Water pollution sources, Bioassay, Brook trout, Shiners, Yellow perch, Isolation, Separation techniques, Microorganisms, Freshwater fish, Water pollution effects, Epizootiology, Fish parasites. Identifiers: "White suckers, "Infectious pancreatic necrosis, "Catastomus commersoni, "IPN virus, Tissue, Biological samples, Sample preparation, Perca flavescens, Esox lucius, Notropis spp, Northern pike, Epizootic, Spleen, Kidneys.

Infectious pancreatic necrosis (IPN) is an acute, highly contagious viral disease normally found in salmonid fishes. The occurrence of the IPN virus in non-salmonid fishes is reported for the first time. Various species of fish were collected with a time. Various species of fish were collected with a fish shocker from the trail waters of two trout hatcheries known to contain IPN-infected brook trout. Viral assays included portions of the spleen and kidney (Hoffman method), visceral homogenates, and the gonad cell line (Wolf and Quimby technique). Only one isolation was made of all fishes examined and this was from one visceral homogenates and from 10 weeling white of an issues examined and this was from one visceral homogenate made from 10 yearling white suckers (Catastomus commersoni). This suggests that non-salmonid fishes may play a role in the ecology and epizootiology of IPN. (Mackan-Battelle) W72-11837

ECOLOGICAL STUDIES OF MERCIERELLA ENIGMATICA FAUVEL (ANNELIDA: POLYCHAETA) IN THE BRISBANE RIVER, Queensland Univ., Brisbane (Australia). Dept. of Zoology. D. Straughan.

The Journal of Animal Ecology, Vol 41, No 1, p 93-136, February 1972. 12 fig, 22 tab, 51 ref.

Descriptors: *Environmental effects, *Limiting Descriptors: *Environmental effects, *Limiting factors, *Biological properties, *Ecology, Australia, Water pollution, Annelids, Invertebrates, Animal populations, Brackish water, Spatial distribution, Water temperature, Distribution patterns, Water quality, Ecological distribution, Biorhythms, Water pollution effects, Physicochemical properties, Estuarine environment, Animal behavior, Competition, Reproduction, Larval growth stage, Water pollution sources, Salinity, Calcium, Ions, Breeding, Growth rates. Identifiers: *Mercierella enigmatica, Polychaetes, *Brisbane River, Substrates, Survival.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Effects of Pollution-Group 5C

The general biology and ecology of the tube building annelid, Mercierella enigmatica, has been studied in a locality where the serpulid is not a pest (Brisbane River) in order to help elucidate possible natural population control factors. The study centered around 7 stations along the river where rapid, boat surveys of the river banks were possible. Collections ranged from rare (1-5/sq ft) to abundant (100 plus/sq ft). Bakelite fouling plates and chequer board plates were placed in wire frames and suspended in the water in order to test horizontal distribution, larvae settling and surface preferences. The galvanized wire frames were also used to determine vertical distributions. Rates of survival, growth, maturation, sex ratios, numbers, used to determine vertical distributions. Rates of survival, growth, maturation, sex ratios, numbers, and length of the specimens and tubes were all recorded as well as the salinity, temperature and chemical composition of the water at the collection sites. Results show the distribution of the tion sites. Results show the distribution of the worm to be primarily controlled by the area of larval settlement, which is affected by salinity, Ca ions, competition, predation, and pollution. Abundance of larval settlement is governed by water flow and substrate and attraction to areas already occupied by Mercierella. Breeding occurs from September to May at salinities from 0.7-3.5 percent. Growth rate depends on age, temperature, salinity, competition and pollution levels. (Mackan-Battelle)

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MERCURY IN THE ENVIRONMENT. A TOX-ICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm (Sweden). Dept.

Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, G. Lindstedt, G. Nordberg, C. Ramel, and S. Skertving. Available from the National Technical Information Service as PB-205 000, \$10.75 in paper copy, \$0.95 in microfiche. November 1971. 550 p, 23 fig, 47 tab, 913 ref.

Descriptors: *Mercury, Water pollution effects, *Public health, *Toxicity, *Heavy metals, *Path of pollutants, *Metabolism, Metals, Water pollution sources, Air pollution, Resistance, Environmental effects, Physiological ecology, Inhibitors, Genetics, Animal metabolism, Animal physiology, Pollutants, Water quality, *Reviews. Identifiers: *Mercury poisoning.

A review of the toxicity of mercury (Hg) is presented. The report, which was based on a literature survey, presents basic information on the toxic action of Hg and on quantitative information regarding the relationship between dose and effect on human beings and animals. Methods of analysis of Hg in the air and in biological material are presented, with transport and transformation of Hg in nature and possible routes of exposure. Hg metabolism is discussed relative to absorption. Hg metabolism is discussed relative to absorption, biotransformation and transport, distribution, retention and excretion, and indices of exposure and retention. The following topics also are included: symptoms and signs of intoxication, normal concentrations of Hg in biological material, exposure/effect relationships of inorganic and organic Hg, and genetic effects of Hg. (LeGore-Washington) Hg metabolism is discussed relative to absorption, ton) W72-11842

IMMOBILIZATION OF FINGERLING SALMON AND TROUT BY DECOMPRESSION, National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center. D. F. Sutherland.

D. F. Sutheriand. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$0.25. NOAA Technical Report NMFS SSRF-655, March 1972. 7 p, 3 fig, 2 ab, 5

Descriptors: *Salmonids, *Chinook salmon, *Rainbow trout, Commercial fish, *Anadromous fish, *Fish barriers, Fish physiology, *Fishkill,

Dams, *Columbia River, *Bioassay, Fish, Fish migration, Fisheries, Pressure. Identifiers: *Coho salmon, *Decompression, Ice Harbor Dam, Snake River, Fingerlings, Immo-

Laboratory experiments revealed that some chin-ook salmon (Oncorhynchus tshawytschka) and coho salmon (O. kisutch) fingerlings are immobil-ized when decompressed from atmospheric pre-sure to high negative pressures. The coho salmon were less severely affected than were the chinook salmon. Studies with coho salmon and rainbow trout (Salmo gairdneri) to determine the effects of decompression within a turbine of a dam did not provide conclusive results. However, some fin-gerlings caught in the tailrace immediately after their release in the turbine intake were immobilized. Exposure to negative pressure below turbine runner blades is one possible cause of immobiliza-tion. (Svensson-Washington) W72-11844

SURVIVAL OF SOME FRESHWATER FISHES IN THE ALKALINE EUTROPHIC WATERS OF NEBRASKA, Hastings Coll., Nebr. D. B. McCarraher. Journal of the Fisheries Research Board of Canada, Vol 28, p 1811-1814, 1971. 2 tab, 10 ref.

Descriptors: *Freshwater fish, *Alkaline water, Lakes, Ponds, *Mineral water, *Aquatic environ-ment, *Bioassay, Water quality, Fish, Water pro-perties, *Nebraska, Perches, Minnows, Sunfishes, Pikes, Bullheads, Channel catfish, Walleye, Bass. Identifiers: *Carbonate alkalinity, *Eutrophic

Of 14 species of freshwater fishes held in cages in one or more of 13 alkaline lakes and ponds in Nebraska, few species survived more than a month where carbonate alkalinity, mostly as compounds of Na2CO3 and KCO3, was above 300 mg/l. Of the 14 species tested, Sacramento perd. Archoplites interruptus), fathead minnow (Pimephales promelas), northern pike (Esox lucius), and the black bullhead (Ictalurus melas) were the most tolerant of alkaline environments. Most centrarchid fish except A. interruptus and the green sunfish (Lepomis cyanellus) did not sur-Most centrarchia fish except A. Interruptus and the green sunfish (Lepomis cyanellus) did not sur-vive more than a month in alkaline waters greater than 950 mg/l total alkalinity. A lake classification index for slightly to strongly alkaline environ-ments is presented, along with suggested fish spe-cies for introduction into such waters. (Svensson-

ROTENONE TOLERANCE IN MOSQUITOFISH, Mississippi State Univ., State College. Dept. of Entomology.

Entomology.
D. L. Fabacher, and H. Chambers.
Environmental Pollution, Vol 3, p 139-141, 1972. 4

Descriptors: *Rotenone, *Pesticides, *Insecti-cides, *Pesticide toxicity, *Enzymes, Fish physiology, *Piscicides, Animal physiology, Bioassay, Pest control, Aquatic environment, Aquatic animals, Fish. Identifiers: *Pesticide tolerance, *Mosquitofish,

Resistance to rotenone is very common among arthropods. An apparent case of rotenone re-sistance in mosquitofish is reported. A research project was established to determine the toxicity of rotenone to resistant and to susceptible fish. Re-sistant mosquitofish showed a 1.8-fold tolerance to rotenone over a susceptible strain. The 24 hr LC-50 values for rotenone in susceptible and resistant fish were 0.017 mg/l and 0.031 mg/l, respectively. Results with sesamex, an inhibitor of mixed function oxidase enzymes, indicated that rotenone

tolerance in mosquitofish is solely the result of in-creased levels of mixed function oxidase enzymes. (Svensson-Washington) W72-11846

EFFECTS OF PENTACHLOROPHENOL ON ENZYMES INVOLVED IN ENERGY METABOLISM IN THE LIVER OF THE EEL, Goteborg Univ. (Sweden). Dept. of Zoophysiolo

gy. S-L. Bostrom, and R. G. Johansson. Comparative Biochemistry and Physiology, Vol 41B, p 359-369, 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Fish physiology, *Pesticides, *Fungicides, *Enzymes, *Eels, *Metabolism, Animal physiology, Phenolic pesticides, Biochemistry, Proteins, Water pollution effects.

Identifiers: *Pentachlorophenol, Metabolic

The effects of PCP in vivo and in vitro on the activity profiles of hexokinase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, pyruvate kinase, lactate dehydrogenase, fumarase and cytochrome oxidase in the liver of the eel were investigated. In vivo results varied according to the enzyme. After a recovery period of 30 days in uncontaminated water the PCP treated eels showed higher activity water the PCP treated cells showed nighter activity levels for all the investigated enzymes compared to the controls. Comparison of enzyme activity ratios in vivo suggests a shift between different metabolic pathways. In vitro PCP inhibits all the investigated enzymes. (Svensson-Washington) W72-11847

EFFECTS OF N-NITROSODIMETHYLAMINE ON THE CRAYFISH, PROCAMBARUS CLAR-

Smithsonian Institution, Washington, D.C. J. C. Harshbarger, G. E. Cantwell, and M. F.

In: Proceedings of the 4th International Colloqui-um on Insect Pathology with the Society for Inver-tebrate Pathology, August 1970. College Park, Maryland. 1971, p 425-430. 7 fig. 8 ref.

Descriptors: *Animal pathology, Animal physiology, *Crayfish, Bioassay, Aquatic animals, Invertebrates, Chemical wastes, Public health, Water pollution effects.

Identifiers: *Pathological models, *Tumors, *Carcinogens, *N-nitrosodimethylamine, *Hyperplasia, *Sublethal effects, Antennal gland, Hepatopancreas, Biological models, *Procambarus clarkii.

Procambarus clarkii were maintained for 6 months in aqueous solutions containing 10, 100, and 200 mg/l N-nitrosodimethylamine—a liver and kidney regit re-introducing in a variety of invertebrates. Micro-scopical studies revealed extensive degeneration in all parts of the antennal gland and hyperplasia of the tubular cells in the hepatopancreas. This discovery of the sensitivity of an easily reared assovery of the sensitivity of an easily reared aquatic invertebrate to a water soluble nitrosamine introduces a practical model for the further study of the biological activity of this family of com-pounds. (LeGore-Washington)

EFFECTS OF TWO INSECTICIDES ON THE VULNERABILITY OF ATLANTIC SALMON (SALMO SALAR) PARR TO BROOK TROUT (SALVELINUS FONTINALIS) PREDATION, Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station. C. T. Hatfield, and J. M. Anderson. Journal of the Fisheries Research Board of Canada, Vol 29, p 27-29, 1972. 1 fig, 11 ref.

Descriptors: *Pesticides, *Insecticides, *Atlantic salmon, *Brook trout, *DDT, Fish, Salmonids,

Group 5C-Effects of Pollution

Trout, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Water pollu-Trout. tion effects.

Identifiers: *Sublethal effects, *Sumithion, Vulnerability, Salmo salar, Salvelinus fontinalis

Experiments were conducted in large outdoor concrete pools in which salmon had access to a safe haven. After exposure for 24 hr to 1 mg/l of the organophosphate insecticide, Sumithion, Atlantic salmon parr were more vulnerable than unexposed fish to predation by large brook trout. Sumithion at .1 mg/l, and DDT at 0.07 mg/l had no noticeable effect. The results, particularly for Sumithion, correlate well with previous laboratory work on the effect of insecticides on the learning ability of salmon. (Svensson-Washington) W72-11850

INITIAL BIOLOGICAL AVAILABILITY OF THE HEAVY METAL RUTHENIUM IN FRESH-WATER, I. INFLUENCE OF SALTS, ANIMAL SPECIES, AND TEMPERATURE UNDER CON-

TROLLED CONDITIONS, Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Laboratoires.

H. Beque, S. Van Puymbroeck, J. Jaumier, R. Bittel, and O. Van Der Borght.

Environmental Physiology, Vol 1, p 37-50, 1971. 12 fig, 3 tab, 10 ref.

Descriptors: *Nuclear wastes, *Radioactive wastes, *Heavy metals, *Snails, Freshwater fish, Aquatic animals, Absorption, Adsorption, Water temperature, Freshwater, Physicochemical properties, Water pollution effects, Bioassay. Identifiers: *Ruthenium, Biological availability, *Ruthenium salts, *Bleaks, Desorption, Lymnaea

spp., Alburnus spp.

The influence of several parameters on the uptake of ruthenium by freshwater organisms had been studied under laboratory conditions during a period of 5 days. The organisms used were Lymnaea stagnalis, Alburnus lucidus, and empty shell of L. stagnalis. These organisms were placed in five different salt solutions: RuCl3, RuNO (NO3)3, RuNOCl3, RuNO (OH)3, and Na2 (RuNO (NO2)4. Some experiments were simultaneously run at three different temperatures. Temperature seems to have little or no influence on the fixation of Ru by snails and fish but is likely to play on important role in the absorption of Ru on empty shells or glass walls. The composition of the solution and thus of the ruthenium salts themselves is the predominant factor governing all fixation and adsorption phenomena. The amount of Ru fixed by the organisms varies by a factor of 14, depending on the salt present in the solution. The study of the biological availability of heavy metals has thus to be coupled with the physicochemical study of the complexes which are released into the biosphere. (Svensson-Washington) W72-11853

ECOLOGICAL STUDIES ON MACROINVER-TEBRATE POPULATIONS ASSOCIATED WITH POLLUTED KELP FORESTS IN THE NORTH SEA, Durham Univ. (England). Dept. of Botany.

D. J. Jones.

1

Helgolaender wissenschaftliche Meeresuntersuchungen, Vol 22, p 417-441, 1971. 10 fig, 7 tab,

Descriptors: Water pollution effects, Ecology, Ecosystems, *Biological communities, *Succession, Aquatic environment, *Ecological distribution, *Estuarine environment, Habitats, Aquatic life, Heavy metals, Industrial wastes, Invertebrates, Algae, *Kelp.
Identifiers: *North Sea, *Laminarea spp., Sewage

pollution, Epifauna.

Two gradients of pollution, one estuarine and one off the open coast, are described. The intervening seacoast has little or no pollution. A comparative method of pollution surveying is presented. Ecological comparison is made of the community development described for clean and polluted sta-tions. Two ecological barriers to normal community development in the polluted environment are postulated. (Svensson-Washington) W72-11854

UPTAKE AND ELIMINATION OF SIMAZINE BY GREEN SUNFISH (LEPOMIS CYANELLUS

Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab. C. A. Rodgers.

Weed Science, Vol 18, No 1, p 134-136, January

Descriptors: Pesticides, *Triazine pesticides, *Pesticide residues, *Sunfishes, *Aquatic weed control, Fish physiology, *Bioassay, Organic pesticides, Pesticide kinetics, Pesticide removal, Carbon radioisotopes, Herbicides.

Identifiers: *Simazine, Lepomis cyanellus.

The uptake and release of 2-chloro-4,6-bis (ethylamino)-s-triazine (simazine) by green sunfish were measured during a 3 week exposure to either were measured during a 3 week exposure to etime-non-labelled or symetrically ring-labelled C-14-simazine. Exposure was by feeding (3 and 10 mg/kg body weight) or bath (1 and 3 mg/l). To determine the retention of simazine, treated fish and remaining after exposure and sampling were placed in freshwater for 4 weeks. This water was changed weekly. Fish in the bath absorb simazine in amounts directly proportional to the concentra-tion in the water, i.e. 0.95 and 2.29 ppm total residue after 3 weeks exposure to 1.0 and 3.0 mg/l, respectively. Little or no simazine was found in feed-exposed fish 72 hr after feeding. Almost all of the residue was in the viscera. No simazine residue was detected in fish from the water bath exposure after they had been in fresh water for seven days. (Svensson-Washington) W72-11855

THE EFFECT OF SUBLETHAL CONCENTRA-TION OF LAS ON THE ACUTE TOXICITY OF VARIOUS INSECTICIDES TO THE FATHEAD (PIMEPHALES PROMELAS. REFINESQUE), Syracuse Univ. Research Corp., N.Y. Life

ences Div.

J. M. Solon, J. L. Lincer, and J. H. Nair, III. Water Research, Vol 3, p 767-775, 1969. 6 tab, 23 ref. PHS ES-00213-02.

Descriptors: *Pesticide toxicity, Pesticide kinetics, *Insecticides, *DDT, *Endrin, Freshwater fish, Bioassay, *Alkyl benzene sulfonate, Organophosphorous pesticides, Teleosts, Piscicdes, Lethal limit, Water pollution effects. Identifiers: "Fathead minnow, "Sublethal concentrations, "Synergism, Pimephales spp.

Simultaneous exposure of the fathead minnow to lethal concentrations of parathion and a sublethal concentration of linear alkyl benzene sulfonate (LAS) resulted in a synergism in the toxic action of the two compounds. This was indicated by a drop in the 96 hr TLm value from 1.410 mg/l for parathion alone to 0.720 mg/l when LAS was present. The mean per cent survival at duplicate 0.800 mg/l concentrations of parathion in the presence of 1.000, 0.500 and 0.250 mg/l LAS was 5.0, 38.5, and 97.5, respectively. The mean survival at duplicate concentrations of 0.800 mg/l parathion alone was approximately 95%. A simple analysis of variance on the above tests showed the difference between the per cent survival for fish exposed to 0.800 mg/l parathion in the presence of 1.000 and 0.500 mg/l LAS respectively and the same concentration of parathion alone to be significant at the 0.05 level. The results of similar tests for DDT were inconsistent and the variability of DDT toxicity appears to be too great to accu rately determine any synergistic action with LAS.
Comparison of the toxicity of endrin in the
presence and absence of LAS shows no synergism
between the two compounds. (Katz-Washington) Desci

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BIOLOGICAL MAGNIFICATION POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM WATER BY AQUATIC INVER-

Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab. H. O. Sanders, and J. H. Chandler.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 5, p 257-263, 1972. 2 fig, 2 tab, 14 ref.

Descriptors: Pesticides, *Pesticide residues, Pesticide kinetics, *Aroclors, *Polychlorinated biphenyls, *Crustaceans, *Aquatic insects, Chlorinated hydrocarbon pesticides, Aquatic animals, Bioas-say, Stoneflies, Dobsenflies, Mosquitoes, Midges, Shrimps, Crayfish, Daphnia, Gas chromatography, Absorption.

Identifiers: *Biological magnification, Scuds,

Biological accumulation.

This study determined the rate of accumulation and biological magnification of Cl-36-labelled Aroclor 1254 from water by eight species of aquatic invertebrates. The animals were exposed to Aroclor 1254 at concentrations less than 0.003 mg/l. In addition to measurements of accumula tion, scud exposed to Aroclor 1254 were analyzed by gas-liquid chromatography to investigate potential shifts in residue composition, which may have occurred as a result of metabolism. (Svensson-Washington) W72-11857

EFFECTS OF COPPER, TITANIUM AND ZIR-CONIUM ON THE GROWTH RATES OF THE RED TIDE ORGANISM, GYMNODINIUM

University of South Florida, Tampa, Dept. of Chemistry. D. F. Martin, and W. K. Olander.

Environmental Letters, Vol 2, No 3, p 135-142, 1971. 2 tab, 10 ref. PHS 1K04 GM 4259-03.

Descriptors: *Copper, *Titanium, *Red tide, *Gymnodinium, *Growth rates, *Dinoflagellates, Humic acids, Public health, Aquatic environment, Chelation, Florida, Water pollution effects.

Identifiers: Trace metals, *Zirconium, Growth constants, Static cultures, Gymnodinium breve.

The role of trace metal elements in outbreaks of the Florida red tide organism, Gymnodinium breve, has been a matter of speculation for many The effects of increments of three trace metal elements on the growth constants of unialgal cultures of G. breve were determined. The results indicate that the growth constants are inversely related to cupric ion concentration (r = -0.714, p =0.1). Zirconium and titanium were found to be concentrated in water taken from a 1956 bloom. In this study, zirconium had no discernable effect and the observed growth constant decreased with increasing concentration of titanium (r = -0.990, p = 0.1). (Svensson-Washington) W72-11860

DIESEL OIL CONTAMINATION OF BROWN TROUT (SALMO TRUTTA L.), Torry Research Station, Aberdeen (Scotland). P. R. Mackie, A. S. McGill, and R. Hardy.

Environmental Pollution, Vol 3, p 9-16, 1972. 4 fig,

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Effects of Pollution—Group 5C

Descriptors: *Absorption, Oil, *Oil pollution, *Oil spills, Water pollution effects, Fuels, Fish physiology, *Trout, *Brown trout. Identifiers: *Seafood contamination, Seafood, Residues, Food contamination, Hydrocarbon

residues. Salmo trutta.

W72-11861

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Hydrocarbons chemically identical to those present in diesel fuel oil have been isolated from trout caught eleven days after a spillage of diesel fuel oil had occurred in their environment. Both the fish after cooking and the hydrocarbon frac-tion isolated from the uncooked fish smelled and tasted similar to the fuel oil. (LeGore-Washington)

EFFECTS OF SEWAGE SLUDGE UPON THE GROWTH AND MORTALITY OF SOME BIVALVE MOLLUSKS, (IN JAPANESE),

Bulletin of the Tokai Regional Fisheries Research Laboratory (Japan), No 63, p 65-73, November 1970. 2 fig, 8 tab, 8 ref. English summary.

Descriptors: *Sewage sludge, *Mollusks, *Oysters, *Marine animals, Municipal wastes, Water pollution effects, Invertebrates, Pelecypods, Bioassay, Growth, Mortality, Clams,

Microorganisms.
Identifiers: "Toxicity bioassay, "Fertilized eggs, "Mollusk food, Tapes spp., Fulvia spp., Monochrysis spp., Meretrix spp., Phaeodactylum spp.

The effects of sewage sludge on the growth and mortality of clams and oysters were investigated. Fifty per cent of Tapes philippinarum died after one week in a 3% mixture of sludge and seawater. The survivors when cooked were inedible. Fulvia mutica fed sludge for 15 days did not grow. In sea-water containing more than 0.05% sludge, the fer-tilized eggs of oysters developed abnormally and the 'D' shaped larvae did not feed. Bivalve larvae could grow in concentrations of sludge of less than count grow in contentiations to studge on bivalves 0.025%. Deleterious effects of sludge on bivalves is due to the suspended matter, bacterial content and chemical constituents. (Katz-Washington) W72-11862

DEGRADATION OF DDT BY GOLDFISH,

New York State Coll. of Agriculture, Ithaca. Dept. of Entomology.
R. G. Young, L. St. John, and D. J. Lisk.
Bulletin of Environmental Contamination and

Toxicology, Vol 6, No 4, p 351-354, 1971. 1 tab, 14

Descriptors: *DDT, *DDD, *DDE, Metabolism, Freshwater fish, Aquatic life, *Chlorinated hydrocarbon pesticides, Pesticide residues, Fish physiology, Degradation (Decomposition). Identifiers: *Goldfish, Fish feeding, Phenobarbitol. Metabolites.

Goldfish were fed DDT for three weeks, then were exposed to phenobarbital solution for one week to study the possibility of microsomal enzyme induction and therefore possible enhanced insecticide excretion. Analysis of DDT, DDE and DDD were made at intervals up to six weeks. Forty percent of made at intervals up to six weeks. Forty percent of the DDT fed was incorporated during the feeding. It was recovered mainly as DDE (68-96%). Signifi-cant differences between pesticide levels of phenobarbital treated and control fish were not found. (Katz-Washington) W72-11863

METHOXYCHLOR, A NEW THREAT TO THE

ATLANTIC SALMON,
Sir George Williams Univ., Montreal (Quebec).
G. M. Kruzynski, and G. Leduc.
Atlantic Salmon Journal, No 1, 5 p, 1972. 6 fig, 1

tab. 14 ref

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Atlantic salmon, *Brook trout, Organic pesticides, Pesticides, Environmental sanitation, Pesticide kinetics, Chemcontrol, Lethal limit, Salmon, Trout.
Identifiers: *Methoxychlor, Salmo spp., Sal-

velinus spp.

Brook trout, Salvelinus fontinalis, were exposed for periods of up to 40 days to an artificial diet containing 0.5-100 ppm of methoxychlor. These dietary levels were chosen on the basis of methoxychlor residues found in aquatic insects which had been exposed to 0.075 mg/l of the insecticide, the standard dosage presently used on the Quebec North shore for blackfly control. Methoxychlor had little effect on the growth in length and weight but produced intermittent mortality and a reduction in swimming stamina at exposure levels of but produced intermittent mortality and a reduction in swimming stamina at exposure levels of 0.01-0.16 mg/kg/day, while fish that had received 1.00 and 2.00 mg/kg/day, while fish that had received 1.00 and 2.00 mg/kg/day had a markedly increased stamina. Residue determinations at the end of the exposure period revealed methoxychlor levels of 2-44 mg/kg in whole fish, while the fat bodies of fish that died during the exposure period contained up to 584 mg/kg of the insecticide. Histopathological observations revealed extensive degenerative changes in liver and kidney tissues and a lowered red blood cell count in fish which had been exposed to the insecticide. (LeGore-Washington) W72-11864

DISTRIBUTION OF IRON, MANGANESE, COPPER, ZINC, AND SILVER IN OYSTERS ALONG THE GEORGIA COAST, Skidaway Inst. of Oceanography, Savannah, Ga. H. L. Windom, and R. G. Smith. Journal of the Fisheries Research Board of Canada, Vol 29, No 4, p 450-452, 1972. 1 tab, 5 ref.

Descriptors: Water pollution effects, *Absorption, Metals, *Heavy metals, *Oysters, *Iron, *Manganese, *Copper, *Zinc, *Georgia. Identifiers: Metal residues, Silver.

The shells and soft tissues of approximately 50 oysters (Crassostrea virginica) collected along the Georgia coast were analyzed for iron, manganese, copper, zinc, and silver. Manganese was the only metal found to be more concentrated in the shells. Correlations between the metals in the soft tissues suggest that iron and manganese, and copper, zinc, and silver form two separate groups of metals which are concentrated similarly by the oyster. Geochemical characteristics of a given metal are an important control in their uptake by the oyster. (Note: In the original title, 'Magnesi-um' is incorrectly substituted for 'Maganese.' The error was corrected in an errata.) (LeGore-Washington) W72-11865

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES, Purdue Univ., Lafayette, Ind. Water Resources Research Center.

J. L. Ahlrichs, L. Chandler, E. J. Monke, and H.

W. Reuszer.

W. Reuszer. Available from the National Technical Informa-tion Service as PB-211 080, \$3.00 in paper copy, \$0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No 10, June 1970. 108 p, 23 fig, 17 tab, 45 ref. OWRR A-005-Ind (16).

Descriptors: "Organic pesticides, "Carbamate pesticides, Dragonflies, Stoneflies, "Pesticide adsorption, Pesticide residues, Pesticide movement, Pesticide kinetics, Adsorption, Farm ponds, Reservoirs, "Indiana, Water pollution effects, "Path of pollutants, "Soil contamination. Identifiers: Collembola, Odonta, Phorate, Carbar-

An interdisciplinary study was made on the terrestrial and aquatic effects of two organo-toxicants, a phorate and a carbaryl, as applied on experimental watersheds in Southern Indiana. Studied were the physio-chemical properties of the soil constituents on the sorption reactions of the toxic substances; bacterial degradation of the pesticides in the reservoirs, terrestrial and aquatic indicator organisms which denoted the presence or effect of the substances, and feasible methods for removal of the substance once entered into the water system. The amount of pesticide lost from an application site into the water system was dependent on the occurrence of runoff-producing storms shortly after application. The two pesticides studied were highly adsorped on the soil as a result applications 4 times recommended dosages produced virtually no trace of the substances in the water. Bacteria were found which could break the ring structure of the carbaryl; however, data concerning the role of microorganisms in the elimination of organo-toxicants from surface water were variable. Detailed before and after application observations of Collembola and Odonata indicated no environmental side effects created by the pesticides. (Wiersma-Purdue)

THE ACUTE TOXICTTY OF HEAVY METALS TO THE LARVAE OF SOME MARINE ANIMALS,

Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.

P. M. Connor.
Preprint, International Council for the Exploration of the Sea, Shellfish and Benthos Committee, Reference 'E', 1971. 9 p, 3 fig, 1 tab, 6 ref.

Descriptors: "Shrimp, "Heavy metals, "Mercury, "Copper, "Zinc, "Lethal limit, Bioassay, "Toxicity, Mortality, Aquatic environment, Water poli-tion effects, Water quality, "Larvae, Marine

Identifiers: *Trace metals, Crangon spp., Ostrea spp., Carcinus spp., Homarus spp., Median lethal concentration.

The toxicity of copper, mercury and zinc to the larvae of Ostrea edulis, Crangon crangon, Carcinus maenas and Homarus gammarus is examined over a period of up to 70 hr. Mercury was more toxic than copper and zinc, which had similar levels of toxicity. Over the experimental period, the relationship between toxicity and concentration was linear. Larvae were from 14 to 1000 times more susceptible than adults of the same species. The median lethal concentrations (LC50) of each metal to the most sensitive species of larvae. metal to the most sensitive species of larvae, tested over a 48 hr period, exceeded the concentrations found in natural seawater by a factor of 100. For longer test periods, the LC50 would be considerably less and this factor would then be considerably reduced. Hence the continued addi-tion of these metals to confined waters should give cause for concern. (Svensson-Washington) W72-11869

THE USE OF A CONTINUOUS FLOW AP-PARATUS IN THE STUDY OF LONGER-TERM TOXICITY OF HEAVY METALS, Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab. K. W. Wilson, and P. M. Connor. Preprint, International Council for the Exploration of the Sea, Fisheries Improvement Committee, Reference 'C', 1971. 9 p, 6 fig, 7 ref.

Descriptors: "Toxicity, "Shrimp, "Mercury, "Cad-mium, "Heavy metals, "Lethal limit, Bioassay, Mortality, Aquatic environment, Water pollution effects, Water quality. Identifiers: "Trace metals, Crangon spp., Moult-ing, Median lethal concentration.

A continuous flow apparatus capable of ad-ministering different, yet constant, concentrations

Group 5C—Effects of Pollution

of toxin to twenty experimental tanks was built or toxin to twenty experimental tanks was out and used to study the toxicity of mercury (as mer-curic chloride) and cadmium (as cadmium chloride) to the brown shrimp, Crangon crangon, over several weeks. After 1500 hr exposure these metals were toxic at 1/1000 and 1/100 of their 48 hr LC50 values. No lethal threshold concentration was established. Although the toxins did not affect the rates at which the animals molted, at the higher concentrations newly molted animals were much more vulnerable, as shown by a decrease in survival time after molting. Smaller shrimp were more sensitive to the toxicants. (Svensson-Washington)

THE RESPONSE OF AQUATIC COMMUNITIES TO SPILLS OF HAZARDOUS MATERIALS, Virginia Polytechnic Inst. and State Univ.,

Blacksburg.

J. Cairns, Jr., K. L. Dickson, and J. S. Crossman.

In: Proceedings of the 1972 National Conference of Hazardous Material Spills, p 179-197. 17 fig, 5

tab. 19 ref.

Descriptors: Water pollution effects, *Chemical wastes, *Ecosystems, *Aquatic environment, *Fish populations, Rivers, Streams, *Aquatic populations, Acidic water, Water pollution, Ecolo-

gy.

Identifiers: *Aquatic communities, Caustic spills, Ethyl benzene-creo-sote, *Hazardous material spills, Macroinvertebrate communities, Species diversity.

From the four case history studies presented it ap-pears that the biological recovery of damaged rivers is a function of the physical, chemical, and biological characteristics of the receiving stream, the severity and duration of the stress, and the availability of undamaged areas to serve as sources for recolonizing organisms. Short term acute stresses produced by the release of acidic of caustic materials into a receiving stream elicit a response pattern in the macroinvertebrate and fish communities typified by an immediate reduction in the number of specimens. When no residual toxicity is found and there are undamaged areas availa-ble to act as sources for recolonizing organisms, a rapid recovery may be expected. For a long term and stresses from materials residual toxicities, the general response pattern is an immediate reduction in both diversity and density of organisms. However, with residual toxicities, the macroinvertebrate organisms that survive the stress seem to be able to establish an interim type of community structure, which lasts as long as the toxicity persists. (Svensson-Washington)

THE SYNERGISTIC EFFECTS OF TEMPERATURE, SALINITY, AND MERCURY ON SUR-VIVAL AND METABOLISM OF THE ADULT FIDDLER CRAB, UCA PUGILATOR, South Carolina Univ., Columbia. Belle W. Baruch

Coastal Research Inst.
W. B. Vernberg, and J. Vernberg.
Fishery Bulletin, Vol 70, No 2, p 415-420, 1972. 6 fig, 7 ref. EPA Program 18080 FYI.

Descriptors: *Water temperature, *Salinity, *Mercury, *Crabs, Animal physiology, *Estuarine environment, *Toxicity, Aquatic environment, Metabolism, Bioassay, Mortality, Water pollution, Water pollution effects.

Identifiers: *Sublethal effects, *Fiddler crabs,

Gill tissues of fiddler crabs were the major site of mercury concentration; lesser amounts accumulated in the hepatopancreas and green gland. Very small amounts were found in the carapace and muscle tissue. No significant differences in the amount of mercury in tissues of males and females were found. A concentration of mercury sublethal to fiddler crabs under optimum conditions of temperature and salinity greatly reduced survival times when crabs were placed under conditions of temperature and salinity stress. Males were more susceptible to the synergistic effects of mercury in combination with environmental stress than were females. Metabolic rates of male and female fiddler crabs were affected by prolonged exposure to mercury both under optimum environmental conditions and under temperature and salinity stress. Metabolic rates of males were more adversely affected than those of females. (Svensson-Washington) W72-11872

THE ALGAL BIOLOGY OF A TROPICAL MON-TANE RESERVOIR (MLUNGUSI DAM,

MALAWI),
Michigan State Univ., East Lansing. Dept. of
Botany and Plant Pathology.

Br Phycol J., Vol 5, No 1, p 19-28, 1970. Illus.

Identifiers: *Algae, Benthos, Biology, Dams, Flow, Malawi, Mlungusi Dam, Nutrients, Plank-ton, Populations, Reservoirs, Spirogyra, *Tropical

The relationships between population changes of planktonic and bottom living algae and major environmental factors are reported for a small tropical reservoir and its inflow stream. Changes in algal crops were largely determined by water flow. The water had levels of dissolved ions comparable with those of rain but maintained large crops of mat-forming algae, particularly Spirogyra sp. This was attributed to an ability of this species to ab-sorb nutrients at low ambient levels while being able to build up a large crop size as a result of its growth-form-resistance to displacement by water movements. Aspects of the biology of benthic algae are discussed in relation to their crop sizes.— Copyright 1972, Biological Abstracts, Inc. W72-11874

EFFECTS OF OXYGEN DEPLETION AND OF CARBON DIOXIDE BUILDUP ON THE PHOTIC BEHAVIOR OF THE WALLEYE (STIZOSTEDION VITREUM, VITREUM), Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. E. Scherer.

Journal of the Fisheries Research Board of Canada, Vol 28, No 9, p 1303-1307, 1971. 4 fig, 13

Descriptors: *Dissolved oxygen, Fish physiology, *Carbon dioxide, *Walleye, Fish behavior, Respiration, Hydrogen ion concentration, Water

Respiration, Hydrogen ion concentration, Water pollution effects.

Identifiers: *Oxygen depletion, *Photic behavior, *Photoacticity, Photosensitivity, Stizostedion spp., Sublethal effects.

In laboratory experiments under overhead white light, wall-eyes displayed a negative phototactic response consistent with field observations and response consistent with field observations ambistological features of the walleye eye. The strength of this innate response proved to be largely dependent on the given respiratory situation: during oxygen depletion and during buildup of free carbon dioxide, the response diminished to the point of obliteration, which occurred at levels leaving mobility and equilibrium of the test specimens still intact. Whereas during the course specimens still intact. Whereas during the course of oxygen depletion a wide indifference zone (little or no chance of light behavior) could be observed from saturation (-acclimation) level down to about 4-2 mg/l, the fish reacted rather sensitively to increase of free CO2. Starting from acclimation levels of 1.0-2.0 mm Hg CO2, the light avoidance response declined gradually while approaching tensions of 5 mm Hg or more, being completely abandoned at levels above 15 mm Hg. This effect abandoned at levels above 15 mm Hg. This effect could not be attributed to pH shifts. (Svensson-Washington) W72-11875

ENVIRONMENTAL CHANGES ASSOCIATED WITH A FLORIDA POWER PLANT,
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Rosensuel School of Marine and Admospheric Sciences, Miami, Fla. M. A. Roessler. Marine Pollution Bulletin, Vol 2, No 6, p 87-90, June 1971. 3 fig, 1 tab, 9 ref.

Descriptors: Bays, *Marine algae, *Marine animals, *Thermal pollution, *Thermal power, At-lantic Ocean, Marine biology, Benthic flora, Bioassay, Cyanophyta, *Florida, Coral, Salinity, Currents (Water), Mollusks, Environmental ef-

Identifiers: *Biscayne Bay (Florida), Heated ef-fluent, Turkey Point (Florida), Turtle grass, Thalassia spp., Udotea spp., Penicillus spp., Lau-rencia spp., Sponges.

Damage to the biota of Biscayne Bay by the Damage to the biota of Biscayne Bay by the heated effluent of a power plant is demonstrated quantitatively and qualitatively. Algae and grasses are replaced by blue-green filamentous algal mats; seasonal recovery is slow and the affected areas contain fewer kinds and smaller numbers of animals. Increased temperature is the chief cause of the changes. (Katz-Washington) W72-11876

TOXIC EFFECTS OF ZINC SULPHATE ON THE GILLS OF RAINBOW TROUT, Bristol Univ., (England). Dept. of Zoology. J. F. Skidmore, and P. W. A. Tovell.

Water Research, Vol 6, p 217-230, 1972. 12 fig, 15

Descriptors: Fish, *Zinc, *Pathology, *Rainbow trout, Aquatic animals, *Toxicity, Water pollution effects, Salmonids, Cold-water fish, Fish physiology.
Identifiers: *Gills, *Inflammatory response,
Epithelium, Lamellae, Pillar cells, Blood flow,

Granulocytes, Respiratory collapse.

The initial changes that occur in the gill tissue of rainbow trout exposed to 40 mg/l Zn (2+) are typical of an acute inflammatory reaction. The epithelium covering the secondary lamellae lifts away in a continuous sheet from the pillar cell system, thus increasing the diffusion distance from water to blood. Blood flow patterns through the lamellae change granulocytes annear in large the lamellae change, granulocytes appear in large numbers within the lamellar blood spaces and beneath the raised epithelium. Finally the lamellar blood circulation stagnates, terminating in respiratory collapse and death of the animal. The dynamics of blood flow during the progressive stages of gill damage are discussed. (Katz-Washington) W72-11877

WATER QUALITY EXAMINATION BY MEANS WATER QUALITY EARNINGS TEST,
OF A CHLAMYDOMONAS TEST,
Pagagreh Inst., Prague (C-

Hydraulic Rezechoslovakia). D. Matulova.

Revue Roumaine de Biologie, Serie de Zoologie, Vol 14, No 2, p 133-138, 1969. 4 fig, 1 tab, 5 ref.

Descriptors: Water quality, *Aquatic microbiology, Waste water (Pollution), *Chlamydomonas, Methodology, Bioindicators, Testing procedures, *Bioassay, Water pollution effects.

Identifiers: *Romania, *Saprobity, Saprobic zones, *Vltava River (Rom), Chlamydomonas

The bioassay with Chlamydomonas cultures, originally proposed as a toxicological test, was ap-plied for water quality examination. Three sampling points near the confluence of the highly pol-luted and variable in composition Botic stream and the Vitava River were chosen. Experiments were carried out with samples collected at the same sampling points for a period of 4 months. The degrees of saprobity of all the samples collected were determined simultaneously. The results ob-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

tained by means of the Chlamydomonas test and the determined degrees of saprobity and the inten-sity of growth of the testing algae are discussed. (Katz-Washington) W72-11878

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LABORATORY STUDIES ON THE SUSCEPTIBILITY OF MOSQUITO-EATING FISH, LEBISTES RETICULATUS AND THE LARVAE OF CULEX PIPIENS FATIGANS TO INSECTICIBES,

Taiwan Provincial Malaria Research Inst., Taipei. P.S. Chen, Y. N. Lin, and C. L. Chung. Journal of the Formosan Medical Association, Vol 70, No 1, p 28-35, January 1971. 2 fig, 4 tab, 8 ref.

Descriptors: *Pesticide toxicity, *Mosquitoes, Biocontrol, *Insect control, *Pest control, *Chemcontrol, Pesticides, Insecticides, Larvae, Publichealth, Vectors (Biological), DDT, Agricultural chemicals, Water pollution sources, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Carbamate pesticides, Diazinon.

Lindane, Parathion, Malathion, Sumithion, Sevin, Arprocarb.

The common guppy, Lebistes reticulatu, is very useful for the control of the mosquito, Culex pipiens fatigans in Bangkok. Synthetic organic insecticides are widely used in an agricultural pest control program as well as in a variety of control programs aimed at the suppression of vector mosquitoes in Taiwan. The toxic effects of some of these compounds to C. pipiens and to L. reticulatus have been compared for the purpose of drawing a basis in the integration of chemical and biological control of C. pipiens to ensure an effective control in the future. (Svensson-Washington) W72-11879

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE ENVIRONMENT, Nebraska Univ., Lincoln. Water Resources

Nebraska Univ., Lincoin. water Resources Research Inst. R. A. Olson, E. C. Seim, J.Muir, and P. N. Mosher. Available from the National Technical Informa-tion Service as PB-211 081, \$3.00 in paper copy, \$0.95 in microfiche. OWRR B-004-NEB (2). Completion Report, June 1, 1972. 96 p, 48 fig, 17 tab, 10 ref.

Descriptors: *Nitrogen, *Phosphorous, *Nebraska, *Nutrients, Eutroplication, *IRRIGATION SYSTEMS.

Identifiers: Soil nutrient accumulations, *Fertilizer pollution, Nutrient sinks, *Groundwater nutrients, Nutrient scavenging, Soil sampling, Surface water nutrients.

This project measured the extent of N and P movement beyond the rooting zone under different agricultural management systems in relation to nutrient contents of ground and surface waters terent agricultural management systems in relation to nutrient contents of ground and surface waters of Nebraska. Deep profiles of land devoted to wheat-fallow, irrigated alfalfa, grass and heavily fertilized corn on hardlands showed limited evidence of deep penetration of nutrients toward the water table. Grass for the upper levels and alfalfa for the deeper profile appeared to be effective scavengers of N that might otherwise have escaped the rooting zone. Movement of N to the water table was evident, however, in valley situations of shallow water table, also in upland areas of deep, coarse textured soils recently brought under intensive agricultural production by center pivot irrigation. Additionally, local mineral N deposits of geologic origin have been found contributing to high nitrate levels of adjacent wells. Although no evidence was found of P movement downward from agricultural practice, concentration of the element in much of the mantlerock of the state was found to be high enough to conthe state was found to be high enough to con-

tribute adequate P to water in contact for eutrophication. Limited change occurred in groundwater nutrient levels during a 10-year period of greatly increased fertilizer use. Concentrations were most closely related to density of irrigation wells and intensity of agricultural production. Stream nutrient concentrations were greatest adjacent to areas of greatest population density and associated maximum sewage and industrial wastes, and with extensive irrigation of adjacent bench and bottom-lands. Stream reservoirs were noted to act as nutrient sinks, with positive effects on water quality. Precipitation was found to be a significant source of nutrients, especially in eastern Nebraska.

EFFECT OF IRON SUPPLY ON THE ACTIVITIES OF THE NITRATE-REDUCING SYSTEM FROM CHLORELLA, Sevilla Univ. (Spain). Dept. of Biochemistry. J. Cardenas, J. Rivas, A. Paneque, and M. Losada. Archives fur Mikrobiologie, Vol. 81, No. 3, p 260-263, January 17, 1972. 2 fig, 16 ref.

Descriptors: *Enzymes, *Iron, *Nitrates, *Reduction (Chemical), Chemical reactions, Chlorella, Ammonia, Cultures, Inhibition, Inhibitors, Chlorophyta, Water pollution effects, Nitrites. Identifiers: *Chlorella fusca, Ferrous sulfate, Culture media, Enzymatic inhibitors, Chemical inter-

In order to study the effect of iron supply on enzymatic activities of the nitrate-reducing system from Chlorella, algal cells were grown on ammonia, a nutritional repressor of the enzymes of the nitrate-reducing system, thereby reducing their levels to negligible values. These cells were then placed in a medium containing iron, as ferrous sulfate, at concentrations from 0-100 micro M, and then measuring the growth as indicated by absulfate, at concentrations from 0-100 micro M, and then measuring the growth as indicated by absorbance changes at 660 nm. Enzyme activities were determined by harvesting, washing, centrifuging, and grinding the cells and then running enzyme and protein tests on supernatant of the extracted, broken cells. It was shown that, in Chlorella, the cellular level of nitrite reductase activity specifically increases in response to the iron content of the culture medium. By contrast, nitrate reductase activity is not affected by iron concentrations. reductase activity is not affected by iron concentration in the nutrient solution under the same conditions. (Mackan-Battelle)
W72-11919

A QUANTITATIVE STUDY OF FACTORS AF-FECTING ALGAL DIVISION SYNCHRONY MEASUREMENTS, Saint Louis Univ., Mo. Dept. of Biology.

D. W. Rooney.

Mathematical Biosciences, Vol. 13, No. 3/4, p 205-211, April 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Algae, *Model studies, Mathematical studies, Digital computers, Data analysis, Equations, Reproduction, Biornythms, Measurement, Populations, Cytological studies, Statistical methods, Cultures.

Identifiers: *Errors, *Synchronous cultures, Autospores, Variability, Bias, Synchrony index, Counting

A digital computer was used to simulate errors in algal cell number measurements used in synchrony index computations. The index S sub R is based on cell counts over a time period in which the number of cells per unit volume increases. Repeated simulating the statement of the three resulting designs of bias and variability in the measured synchrony index S sub R depend not only on the magnitude of error in cell number measurements, but also on the number of such measurements and the autospore yield at division. The simulations demonstrated that bias and variability in measured S sub R decrease with increases in autospore yield. The

variability in measured S sub R increases with increasing frequency of periodic cell counts. Minimal bias of S sub R occurs at intermediate cell count frequencies. (Snyder-Battelle) W72-11920

DUCK HEPATITIS VIRIS INTERACTIONS WITH DDT AND DIELDRIN IN ADULT MAL-

LARDS, Wisconsin Univ., Madison. Dept. of Veterinary

Science.
M. Friend, and D. O. Trainer.
Bulletin of Environmental Contamination and
Toxicology, Vol. 7, No. 4, p 202-206, April 1972. 1
fig, 1 tab, 15 ref.

Descriptors: *Dieldrin, *DDT, *Mallard duck, *Pesticide toxicity, Viruses, Waterfowl, Gas chro-matography, Ducks (Wild), Chlorinated hydrocar-bon pesticides, Lethal limit, Chemical analysis, Bioassay, Metabolism, Halogenated pesticides, Biodegradation, Mortality. Identifiers: *Duck hepatitis virus, *Chemical in-teraction, Anas platyrhynchos.

Adult mallard ducks injected with a lethal dose of a duckling lethal strain of duck hepatitis virus (DHV) were used to determine if infection with DHV had any effect on the toxicity of p,p'-DDT or technical grade dieldrin. Pesticide-treated rations of 500 or 900 pm DDT, or 40 or 80 ppm of dieldrin were fed to the test animals. Mortality in all but one group (40 ppm dieldrin) receiving both DHV and either pesticide was less than the mortality in the corresponding group receiving a pesticide only. Gas chromatographic analyses indicated that the average ratios of brain to whole carcass pesticide residues at the end of the experiment were approximately 2-3 times greater among the pesticide-only groups than for those exposed to both DHV and a pesticide. The 'protective effect' of DHV was manifest as reduced total mortality, delayed onset of mortality, and altered mortality pattern. The delayed onset of mortality is deemed to be due to the stimulation of enzymes systems responsible for DDT and dieldrin metabolism which allows for the degradation of larger amounts of pesticides in the liver. Therefore the amount of residue reaching the brain is reduced. (Holoman-Battelle) W72-11922

EYES BENEATH THE WAVES, Durham Univ. (England). Dept. of Botany. D. Bellamy.

New Scientist, Vol. 54, No. 791, p 76-68, April 13,

Descriptors: *On-site investigations, *Scuba diving, *Sea water, *Data collections, Copper, Lead, Heavy metals, Mussels, *Kelps, Starfish, Crustaceans, Food chains, Food webs, Water pollution effects, Aquatic environment, Turbidity, Water pollution, Phaeophyta, Mollusks, Marine algae, Marine animals.

Identifiers: England, Bioaccumulation, Biological magnification, Fate of pollutants.

Data collected by amateur divers along the east coast of Britain shows that in polluted sites kelp fails to grow at depths below 4 m, whereas in unfails to grow at depths below 4 m, whereas in unpolluted waters it normally grows to at least twice that depth. Since kelp depth ranges can be controlled by at least 2 main factors, light and bare rock area, it is presumed that increased turbidity is the controlling factor in polluted water. Studies in naturally turbid water support this contention. In another study, the background count of heavy metals of an 'inshore food web' was ascertained by the collection of algae, mussels and starfish for analysis of lead and copper in their tissues. At the two unpolluted sites tested, both metals appeared to be biologically concentrated along the food chain, while at the 2 polluted sites no overall biological concentration was indicated. The

Group 5C—Effects of Pollution

animals from the polluted areas display concentration of the metals at 1-2 times the concentration in unpolluted samples. (Mackan-Battelle) W72-11925

HYDROBIOLOGICAL STUDIES IN THE CATCHMENT OF VAAL DAM, SOUTH AFRICA. PART 3. NOTES ON THE CLADOCERA AND COPEPODA OF STONES-IN- CURRENT, MARGINAL VEGETATION AND STONY BACKWATER BIOTOPES, Noticeal last for Water Research.

National Inst. for Water Reserve, Congella (South Africa). Regional Lab.

F. M. Chutter.

Revue Internationale der Gesamten Hydrobiologie, Vol. 56, No. 3, p 497-508, December 31, 1971. 2 tab, 57 ref.

Descriptors: Water pollution effects, *Copepods, *Distribution patterns, Spatial distribution, Water-fleas, Biorhythms, Sediments, Sewage effluents, Stratification, Effluents, Juvenile growth stage, Density, Aquatic environment, Sampling, Crustaceans, Seasonal, Aquatic animals, Industri-

Crustaceans, Seasonal, Aquatic animals, Industrial wastes, Rivers, Vegetation, Daphnia.

Identifiers: *Cladocera, *South Africa, *Vaal Dam, Biotopes, Bosmina, Moina, Diaptomus, Simocephalus expinosus, Simocephalus serrulatus, Simocephalus vetulus, Ceriodaphnia, Ilyocryptus, Macrothrix, Acroperus, Alona, Camptocerus, Leydigia, Pleuroxus, Chydorus, Mesocyclops, Paracyclops.

The occurrence of Cladocera and Copepoda in the catchment of Vaal Dam was related to the biotopes sampled, the seasons and the zonation of the rivers. A square foot Surber sampler or a circular hand net was used to sample the 'stones-in-current' fauna, while collection of organisms in the 'marginal vegetation' zones was done by hand net. Zones where conditions were unstable due to the deposition and/or transport of sediments yielded the fewest specimens. Population levels were down during the summer rainy season but increased during the winter to peak in early summer. Large densities of Cladocera and Copepoda were found in locations where treated sewage and industrial effluents entered the rivers. (Snyder-Battelle) W72-11926

EFFECTS OF FEEDLOT RUNOFF ON WATER QUALITY OF IMPOUNDMENTS, Robert S. Kerr Water Research Center, Ada,

Okla.

W. R. Duffer, R. D. Kreis, and C. C. Harlin, Jr. Copy available from GPO Sup Doc EPA-16080 GGP, \$0.65; microfiche from NTIS as PB-211 124, \$0.95. Supt. of Documents U.S. Gov't. Print. Off Washington, D.C. 20402. Water Pollution Control Research Series, Environmental Protection Agency July 1971, 53 p, 13 fig, 7 tab, 9 ref, append. EPA Program 16080 GGP 07171.

Descriptors: Reservoirs, *Fishkill, *Ammonia, Descriptors: Reservoirs, *Fishkili, *Ammonia, *Dissolved oxygen, Runoff, *Feedlots, Organic wastes, Nutrients, Phytoplankton, Light penetration, Zooplankton, Bethos, *Farm wastes, Water pollution sources, Cattle.

Identifiers: Solids concentrations.

Effects of rainfall runoff from a beef cattle feedlot on the water quality of a small impoundment were determined. Changes in chemical concentration of impounded water and changes in the community structure of aquatic organisms were measured and related to the amount and composition of feedlot runoff received. Water quality changes were also monitored in a nearby reservoir which received no feedlot runoff to serve as a control. Rainfall from feedlots was retained in collection ponds and pumped into the impoundment over a relatively short period of time, creating in effect a 'slug' discharge conditon. Changes in chemical concentration or population structure of organisms were

not apparent for discharges of about one-part feedlot runoff to 40 parts receiving water. Runoff discharges for two pumping periods with each con-tributing one-fourth of the volume of the receiving water were shown to degrade water quality in the impoundment. Several significant chemical and biological changes occurred. The concentration of salts, solids, oxygen-demanding organic com-pounds and nutrients increased. Population levels decreased for organisms having negative tolerances for low dissolved oxygen and high ammonia concentrations. The most dramatic reduction in the biological community was the suffoca-tion of about 90% of the game fish in the impound ment. Reduction in population levels of 'stressed' organisms was followed by increased productivity of phototropes in response to higher nutrient con-centrations. (Dorland-Iowa State)

OXYGEN DEPLETION IN ICE COVERED

RIVER, Alberta Univ., Calgary. Dept. of Civil Engineer-

For primary bibliographic entry see Field 05B. W72-11989

THE STANDING CROP AND PRIMARY PRODUCTIVITY OF THE EPIPHYTON ATTACHED TO EQUISETUM FLUVIATILE L. IN PRIDDY POOL, NORTH SOMERSET, Alberta Univ., Calgary. Dept. of Botany.

M. Hickman BR Phycol J. 6(1): 51-59. Illus. 1971.

Identifiers: England, *Epiphyton, *Equisetum-Fluviatile-P, North, Pool, Priddy, *Primary productivity, Somerset, Standing crops.

The standing crop and primary productivity of a defined epiphytic algal community was studied over a period of 2 yr. The primary productivity method was analyzed statistically. Because of the shallowness of the pond and large surface area of Equisetum stems available for colonization the epiphyton is the most productive algal community.—Copyright 1972, Biological Abstracts, Inc. W72-12007

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS,

Laboratory of Limnology, Leningrad (USSR). For primary bibliographic entry see Field 05B. W72-12015

RELATIONS BETWEEN FE IN IRRIGATION WATER AND LEAF QUALITY OF CIGAR WRAPPER TOBACCO, Agricultural Research and Educational Center,

Quincy, Fla. or primary bibliographic entry see Field 03F. W72-12028

CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT, Robert S. Kerr Water Research Center, Ada,

For primary bibliographic entry see Field 05G. W72-12072

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS, Hydroscience, Inc., Westwood, N.J. For primary bibliographic entry see Field 05B. W72-12074

RESIDUES IN FISH, WILDLIFE, AND ESTUA-

Bureau of Fisheries and Wildlife Service, Sacramento, Calif. Div. of River Basin Studies. For primary bibliographic entry see Field 05B. W72-12077

A STUDY OF THE EFFECTS OF A COMMER-CIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE

Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab. M. F. Godcharles.

Technical Series No. 64, July 1971. 58 p, 6 fig, 13 tab, 34 ref. NOAA PL 88-309, Project No. 2-53-R.

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Descriptors: *Florida, *Estuaries, *Dredging, *Clams, *Benthos, *Aquiculture, Benthic fauna, Vegetation regrowth, Grasses, Harvesting, Fish Identifiers: Trynet sampling, Benthic plug

sampling, *Dredging effects.

A systematic sampling program to study the effects of a Maryland soft-shell escalator clam dredge, the R/V Venus, on bottom habitats in Tampa Bay was conducted. Trynet samplings were taken before dredging and at various inter-vals after dredging. Benthic plug and sediment samples were included in the final sampling. Fauna were collected, identified, counted and measured. Recolinization of seagrasses had not occurred after more than one year after dredging. No increase of clam set was observed. Trynet haul analysis revealed no faunal variation between dredged ysis revealed no faunal variation between dredged and control areas. Benthic plug samples showed faunal differences at only one station. Dredging uprooted all vegetation and tracks remained from 86 to 500 days. An inventory of clams was con-ducted in Tampa and Boca Ciega Bays, Cedar Keys and the Tarpon Springs area. Results are given and recommendations are made to haresters. (Ensign-PAI) W72-12083

AQUATIC VASCULAR PLANT DISTRIBUTION CHEAT LAKE (LAKE LYNN), WEST VIR-GINIA, West Virginia Univ., Morgantown.

J. F. Clovis.

Castanea. Vol 36, No. 3, p 153-163. 1971. Illus.

Identifiers: Mine acids, *Aquatic plants, Distribu-tion, *Cheat Lake (W. VA.), Water pollution, Records, Wastes, West Virginia.

A compiling of the aquatic vascular plants of Cheat Lake, with notes as to their abundance and distribution, is given. Cheat Lake is fed by Cheat River, which is becoming increasingly mine-acid polluted, and a record of the plants and some present conditions was considered improtant to future studies. Ten new county records and 2 new state records are included.--Copyright 1972, Biological Abstracts, Inc. W72-12085

PRELIMINARY INVENTORY OF MARINE IN-PRELIMINARY INVENTORY OF MARINE INVENTEBRATES COLLECTED NEAR THE ELECTRICAL GENERATING PLANT, CRYSTAL RIVER, FLORIDA, IN 1969, Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab. W. G. Lyons, S. P. Cobb, D. K. Camp, J. A. Mountain, and T. Savage. Professional Papers Series, No. 14, June 1971. 53 p, 10 fig, 5 tab, 73 ref.

Descriptors: *Florida, *Water pollution effects, *Electric powerplants, *Thermal pollution, *Invertebrates, *Distribution patterns, *Spawning, *Seasonal, *Temperature, *Salinty. Identifiers: *Crystal River (Florida), Species com-

An inventory of marine invertebrates in the estuarine area near the elecetrical generating plant at Crystal River, Florida, was taken. Two hundred and eight-six taxonomic groups of invertebrates were collected and studied for composition, dis-tribution, spawning periods and seasonal occur-rence in relation to the effects of heated effluents from the adjacent power plant on these organisms. Temperature was of less importance than salinity in determining local distribution. Most Crystal River species are wide ranging forms capable of a wide variation of environmental conditions. Distribution patterns of these estuarine species ranged from the Gulf of Mexico to New England, others from the Carolinas to Brazil and some species from New England to Brazil. (Ensign-PAI) W72-12087

IMPACT OF PETROLEUM SPILLS ON THE CHEMICAL AND PHYSICAL PROPERTIES OF THE AIR/SEA INTERFACE, Naval Research Lab., Washington, D.C.

For primary bibliographic entry see Field 05B. W72-12090

ECOLOGICAL CONSEQUENCES OF MARINE

POLLUTION, Ljubljana Univ., (Yugoslavia). Dept. of Biology.

Revue Internationale D'Oceanographie Medicale, Vol. 24, p 13-46, 1971. 7 fig, 7 tab, 45 ref.

Descriptors: *Pollutants, *Organic matter, *Sewage, *Primary productivity, *Secondary productivity, *Equilibrium, *Ecology, Physical properties, Nutrients, Trace elements, Vitamins, Amino acids, Plant physiology. Identifiers: North Adriatic, North Africa coast (Laka of Turis)

(Lake of Tunis).

The effects of primary organic pollution on biological equilibrium and bioproduction were studied in the North Adriatic and northern African coastal waters. Physio-ecological stresses, regressions in specific diversity, reductions of natural interspecific competition and the nutritive and fertilizing effects of primary organic pollution were considered. Secondary organic pollution, under certain circumstances, causes an increase of bioproductivity in discharge areas. Marine primary productivity correlates in polluted environments productivity correlates in polluted environments with supplies of inorganic nutrients, trace elements, some vitamins, certain amino-acids, and unknown sewage born factors which may be related to plant hormonal activity. Control of marine organic pollution and possible constructive uses of this pollution are suggested. (Ensign-PAI) W72-12094

MARINE AND FRESH WATER POLLUTANTS, (POLLUTIONS MARINES ET POLLUTIONS DES EAUX DOUCES),... Institut Pasteur, Lille (France). Laboratoire d'-

Hydrobiologie. H. Leclerc.

Revue Internationale D'Oceanographie Medicale, Vol. 24, p 155-170, 1971. 32 ref. Article in French.

Descriptors: *Microbiology, *Pollutants, *Public health, *Epidemiology, *Industrial plants, *Standards, *Bacteria, *Salmonella, Outlets, Sewage bacteria, Waste water treatment, Sampling, Waste dilution, Diffusion, Resources, Investment, Productivity, Ecology.
Identifiers: *Vibrio parahaemolyticus, *Clostridium botulinum, Type E.

Microbial pollutants in the marine and freshwater environments are studied in regard to the pollu-tants' influence on public health. Stricter supervi-sion of the marine consumable products industry is suggested. Investigation problems of the virus Salmonella as a contaminant are discussed. The inaccuracies in sampling, the inability of wastewater treatment to eliminate bacterial and viral pollu-tants, the dynamics of the bacterial particles at an outfall site, epidemiological surveys in recreation areas and the dilution and diffusion phenomena and the unutuon and diffusion phenomena are dealt with taking into consideration the local resources, investments, marine productivity and ecology. (Ensign-PAI) W72-12096 BIG BEEF ESTUARY PHYTOPLANKTON AND

BACTERIA STUDIES 1968-1969, Washington Univ., Seattle. F. Palmer, J. Heller, J. Gatjens, and R. Hung. Washington Sea Grant Program, WSG-MP 71-5, December 1971. 34 p. 12 fig, 8 tab, 4 ref. GH-9 and GH-40.

Descriptors: *Estuaries, *Data collections, *Phytoplankton, *Animal populations, *Bacteria, *Shellfish, *Indicators, *Ecology, *Washington. Identifiers: *Big Beef Estuary (Wash), *Hood

Data from studies at Big Beef Estuary are presented in tables and figures and each is explained. Estimates of phytoplankton populations, bacteria of shellfish sanitation significance, total food for shellfish and indicators of ecological change are emphasized. The data will be used to compare Big Beef with other estuaries and as a reference for future long-term changes at Big reference for future long-term changes at Big Beef. (Ensign-PAI) W72-12097

INDUSTRIAL WASTES: EFFECTS ON TRINITY RIVER ECOLOGY, FORT WORTH, TEXAS. Texas Christian Univ., Fort Worth. Dept. of Biolo-

Copy available from GPO Sup Doc as EPA 18050 DBB 12/71, \$1.50; microfiche from NTIS as PB-211 167, 50.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 163 p. 21 fig. 77 tab, 77 ref, ap-pend. EPA Program 18050 DBB 12/71.

Descriptors: *Bioassay, Water quality, *Industrial effluents, Water pollution, *Toxicity, *Sewage effluents, *Benthic fauna, *Seston, Fish, Minnows, Fry, Channel catfish, Shiners, Bass, Sunfish, Fish eggs, Trace metals, Biochemical oxygen demand, Chemical oxygen demand, Conductivity, Food processing industry, Acid wastes, *Texas.

Identifiers: *Fish development, *Abioseston, *Bioseston, *Fort Worth (Tex), *Trinity River, Quantitative study, Distribution, Invertebrates, Turbidity, River discharge, Food processing wastes, Dissolved oxygen.

Toxicity of industrial effluents discharged directly into or in close proximity to the Trinity River was investigated through a 27-month period. The investigation was concerned with four aspects-bioassay, growth and development, chemistry and benthos. Three industries contributed toxic materials which had a significant influence on the materials which had a significant influence on the surrounding aquatic community. Toxicity ranges were established for the respective effluents using mature minnows, fry and spawn. Fry surviving 96-hour exposure to some of the effluents later developed orientation problems and varied noticeably in growth. Fry were only slightly less resistant to the effluents than minnows, but were judged to be reasonably reliable bioassay test or provincer. Effluents from a relixed equipment judged to be reasonably reliable bioassay test or-ganisms. Effluents from a railroad equipment cleaning area, a plant producing cracking catalysts used in processing combustion engine fuels and as sewage treatment plant influenced the water quali-ty of the river downstream from the outfalls. The ranges of nitrates, phosphates, biochemical ox-ygen demand and specific conductance for the river were increased by the effluents. Environ-mental stress was detected at the railroad equipmental stress was detected at the railroad equip-ment cleaning area outfall and even more at the plant producing cracking catalysts. Benthos were not able to live in the flocculent material discharged in the latter effluent. The drastic reduc-tion in investments of the savest treatment plant tion in invertebrates at the sewage treatment plant is believed to have resulted from the chlorinated effluent. W72-12109

EFFECTS OF LONG-TERM EXPOSURE TO CARBARYL (SEVIN) ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE

FATHEAD MINNOW (PIMEPHALES PROMELAS), National Water Quality Lab., Duluth Minn.

National water Quality Later, scale of A. R. Carlson.

Journal of the Fisheries Research Board of Canada, Vol. 29, No. 5, 1972, p 583-587. 4 tab, 18

Descriptors: *Pesticide toxicity, *Carbamate pesticides, *Minnows, *Bioassay, Life history studies, *Spawning, *Toxicity, Water pollution effects.

Identifiers: *Carbaryl toxicity, *Acute toxicity,

*Fathead minnows.

When fathead minnows (pimephales promelas) were exposed to five concentrations (0.008-0.68 mg/liter) of the insecticide carbaryl for 9 months and throughout a life cycle, the highest concentration prevented reproduction and decreased survival. At the high concentration, testes contained motile sperm and ovaries were in a flaccid condition and appeared to be in a resorptive state. At the 0.68 mg/liter concentration, carbaryl appeared to contribute to mortality of larvae (produced by unexposed parents) within 30 days of hatching. Survival of young grown in the 0.008 mg/liter concentration was reduced. Since no demonstrable effects were noted for survival, growth, or reproduction at the 0.017, 0.062, and 0.21 mg/liter concentrations, this low survival value is considered not due to carbaryl. The 96-hr median tolerance concentration (TL 50) and the lethal threshold concentration (CATC) for 2-month-old fathead minnows were 9.0 mg/liter. The maximum acceptable toxicant concentration (MATC) for fathead minnows exposed to carbaryl in water with a hardness of 45.2 mg/liter and a pH of 7.5 lies between 0.21 and 0.68 mg/liter. The application factors (MATC/96-hr TL50 and MATC/LTC) both lie between 0.023 and 0.075. (Lewis-EPA) W72-12119

VIRUCIDAL ACTIVITY OF TWO IODOPHORS TO SALMONID VIRUSES, Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab. D. F. Amend, and J. P. Pietsch. Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 61-65, January 1972. 4 tab, 9 ref.

Descriptors: *Viricides, *Fish diseases, *Pesticide toxicity, *Viruses, Water pollution sources, Fish parasites, Pest control, Disinfection, *Salmonids, Pollutant identification, Fish eggs, Fish hatche-

Identifiers: *Iodophors, Infectious hematopoietic Identifiers: Ideophors, infectious nematopoietic necrosis, Infectious pancreatic necrosis, Viral hemorrhagic septicemia, Betadine, Wescodyne, IHN virus, IPN virus, VHS virus, Iodinated hydrocarbon pesticides, Pimephales promelas, Fathead minnows.

Fathead minnows.

The virucidal activities of Wescodyne (trademark) and Betadine (trademark) organic iodine complexes have been tested against infectious hematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN), and viral hemorrhagic septicemia (VHS) viruses isolated from rainbow trout. The viruses were grown, isolated, diluted, and mixed with an equal volume of each diluted iodophor. Both iodophors were about equally effective on all three viruses. Each iodophor completely destroyed IHN virus within 30 seconds at 12 ppm iodine, and was not affected by water hardness. However, virucidal activity was reduced at pH levels above 8.0 in the presence of organic matter. After being compared with seven disinfectants commonly used in fish hatcheries for their virucidal activities against IHN virus, Wescodyne as well as chlorine were the only disinfectants completely destroy the virus. Either Wescodyne or Betadine would effectively destroy the salmonid viruses at less than 25 ppm iodine within 5 minutes in solutions near neutrality. (Byrd-Battelle) W72-12160

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Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C-Effects of Pollution

INACTIVATION PARAHAEMOLYTICUS VIBRIO DISTILLED

WATER, Oregon State Univ., Corvallis. Dept. of Food Science and Technology. J. S. Lee.

Applied Microbiology, Vol. 23, No. 1, p 166-167, January 1972. 2 fig, 5 ref.

Descriptors: *Pathogenic bacteria, *Inhibition, Aerobic bacteria, Ösmosis, Water treatment, Water pollution control, Water quality, Osmotic pressure, Water quality control, Enteric bacteria, seudomonas. Identifiers: *Inactivation, *Viparahaemolyticus, *Distilled water, Cytolysis.

The osmotic fragility of Vibrio parahaemolyticus was demonstrated by placing a loopful of cells, grown on salt-supplemented Brain Heart Infusion agar (BHI), into sterile, glass-distilled water. A lml sample of this suspension was resuspended in 99 ml of a sterile 3 percent NaCl solution at 1 minute intervals for 30 min. One-tenth-ml samples of appropriate dilutions were spread-plated on BHI agar and incubated for 24 hr at 37 C. It was discovered that 90 percent of the cells are readily inactivated within 0.9-4.4 min, and that increasing cultural age imparted only slight resistance against inactivation. (Mackan-Battelle) W72-12163

EFFECT OF PH ON THE PATHOGENIC FUNC-TIONS OF SALMONELLA TYPHIMURIUM, McGill Univ., Sainte Anne de Bellevue (Quebec).

Dept. of Microbiology.
E. S. Idziak, and P. Suvanmongkol.
Canadian Journal of Microbiology, Vol. 18, No. 1, p 9-12, January 1972. 2 fig, 4 tab, 16 ref.

Descriptors: *Pathogenic bacteria, *Toxicity, *Hydrogen ion concentration, Aerobic bacteria, Salmonella, Acidity, Alkalinity, Separation techniques, Food processing industry, Water pollution effects, Acidic water, Water properties. Identifiers: *Salmonella typhimurium, Culture media, Endotoxin.

Toxicity changes of Salmonella typhimurium ap-Toxicity changes or sammoneus typnimumum appear related to pH changes during incubation and growth. To test this, shake cultures of the microbe were incubated at 37 C on a growth media of Brain Heart Infusion (BHI) agar at pH 5.5, 7.5, and 9.5. Cells for endotoxin extraction were grown at 37 C in 10 1 of pH adjusted test media in an impeller drawn fermentor. Cell suspensions were cen-trifuged washed in saline, and divided for identification and lyophilization. A crude endotoxin (LPS) was extracted from the lyophilized cells by a phenol-water procedure and the toxicity of the extract assayed by inoculating the choricallantoic membrane of 10-day chick embryos. The infectivity and virulence of the cells grown at different pH levels were determined by inoculating the yolk sac of I day old chicks. Results of the testing show that Salmonella typhimurium increased in virulence during growth in an acid environment whereas in a near neutral environment, the reverse was true. The lipopolysaccharide content of acid-and alkaline-grown cells remained relatively constant during growth, but that in neutral-grown cells decreased. The crude endotoxin extracted from acid-grown cells was slightly more toxic than that extracted from either neutral-or alkaline-grown cells. (Mackan-Battelle) W72-12165

ACCUMULATION OF ALDEHYDE INTER-MEDIATE BY PSEUDOMONAS AERUGINOSA IN GROWING CULTURE ON TETRADECANOL, (ANREICHERUNG DER AL-WACHSENDEN KULTUR VON PSEU-DOMONAS AERUGINOSA BEIM ABBAU VON TETRADECANOL), Muenster Univ. (West Germany). Institut fuer Mikrobiologie.

For primary bibliographic entry see Field 05B. W72-12170

USEFULNESS OF CULTURES IN THE TAX-ONOMY OF BLUE-GREEN ALGAE, (BENUT-ZUNG VON KULTUREN IN DER BLAUALGEN-TAXONOMIE), Ceskoslovenska Akademie Ved. Trebon.

Botanicky Ustav. I. Komarek

Schweizerische Zeitschrift fur Hydrologie, Vol. 33, No. 2, p 553-565, December 1971. 3 fig, 2 tab,

Descriptors: *Cyanophyta, *Cultures, *Systematics, Classification, *Aquatic algae.

Identifiers: Cultuturing techniques, Culture media, Algology, Taxon.

Cultivation, behavior pattern and other difficulties arising from the study of blue-green algae in cul-tures are studied. Some of the properties of the Cyanophyta which cause complications in taxonomy include the following: (1) Special nutrient solutions are needed for many strains; (2) The great variety of ecological needs places particular devariety of ecological necus places particular user mands on cultivation and presupposes technical equipment which cannot be standardized; (3) Atypical forms that do not correspond to ecotypes in nature result when many of the strains are cul-tivated; (4) It is difficult to draw general conclusions from the relatively small amounts of comparable data obtained from parallel experiments. However, cultivation is recommended for the following cases: (a) study of potential variability in the clonal population; (b) comparison of induced variability of one feature in several strains; (c) definition of quantitative or qualitative differences among some strains or verification of their taxonomical identity; (d) determination of utier tax-nomical identity; (d) determination of utirastruc-tural, physiological and biochemical properties of a taxon. (Snyder-Battelle) W72-12172

MICROBIAL DEGRADATION OF STEROLS, Searle (G.D.) and Co., Chicago, Ill. Div. of Biological and Biochemical Research. For primary bibliographic entry see Field 05B. W72-12174

SURVIVAL OF VIBRIO PARAHAEMOLYTICUS IN SHRIMP TISSUE UNDER VARIOUS EN-VIRONMENTAL CONDITIONS,

Texas A and M Univ., College Station. Dept. of Animal Science.

Amma Science. C. Vanderzant, and R. Nickelson. Applied Microbiology, Vol 23, No 1, p 34-37, January 1972. 4 fig, 7 ref.

Descriptors: *Pathogenic bacteria, *Shrimp, *Environmental effects, Aerobic bacteria, Resistance, Hydrogen ion concentration, Temperature, Freezing, Cultures, Heat resistance, Enteric bacteria. Identifiers: *Vibrio parahaemolyticus, *Survival, *Tissue culture, Culture media, Sample preparation, Pseudomonads, Biological samples.

In order to determine its role in foodborne illness, Vibrio parahaemolyticus, culture O, was isolated from Gulf Coast shrimp and maintained on trypfrom Gulf Coast shrimp and maintained on tryp-ticase soy agar slants at 25C. Survival studies in-volved inoculation of whole or homogenated unin-fected, skinned shrimp and then subjecting the samples to freezing (3,7,10, minus 18C), heating (60,80,100C) and changing pH (1-10). In another test, cells were added to porcine gastrointestinal contents. After treatment samples were stored and slated for countinest intervals of 0.8 days. Counts plated for counting at intervals of 0-8 days. Counts were made by spreading appropriate dilutions on either MT medium or TSA plates and incubating for 24 hr at 35C. Although large decreases in viable populations occurred during storage for 2 days at 10 to minus 18C, survivors were present even after 8 days. No significant differences were observed in the population changes of inoculated whole shrimp as compared with shrimp homogenates. Low populations 500/ml of V. parahaemolyticus were destroyed by heating shrimp homogenates at 60, 80, and 100C for 1 min. With larger populations 200,000/ml, some survivors were present after 200,000/ml, some survivors were present after heating at 60 and 80C for 15 min. None survived 1 min at 100C. V. parahaemolyticus was very sensi-tive to pH values below 6.0. Cells survived for several hours in the contents of the porcine gas-trointestinal tract. (Mackan-Battelle)

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BIOLOGICAL IMPACT OF A LARGE-SCALE DESALINATION PLANT AT KEY WEST, Westinghouse Ocean Research Lab., Annapolis,

R. H. Chesher. Copy available from GPO Sup Doc as EPA 18080 GBX 12/71 for \$1.25; microfiche from NTIS as PB-211 183, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 150 p, 60 fig, 10 tab, 45 ref, ap-pend. EPA Program 18080 GBX 12/71.

Descriptors: Water pollution effects, *Desalination plants, *Biological communities, *Copper,
*Toxicity, Thermal stratification, Subtropic,
*Florida, Thermal pollution, Ions, *Flash distillation, Corrosion. Identifiers: *Key West, Multi-stage-flash evapora-

An eighteen month biological study showed the heated brine effluent from a desalination plant in Key West, Florida caused a marked reduction in biotic diversity. Some organisms were more abundant in the receiving waters than in control areas but these were generally capable of isolating thembut these were generally capage or isonating themselves from the effluent by closing up or by moving to other areas during periods of high contamination. Ionic copper, discharged from the plant, was the most toxic feature of the effluent. Temperature and salinity of the effluent and the receiving water were such that the effluent stratified at the bottom of the receiving basin. This stratification reduced water circulation and the man-made harbor acted as a settling basin which lessened the impact of the discharge on surround-ing natural environments. Periodically, the plant shut down for maintenance or cleaning. When it resumed operations, low temperature water of am-bient salinity was discharged which was highly contaminated with ionic copper. These sudden ef-fusions caused more biological damage than steady-state conditions. At the end of the study, extensive engineering changes were made to cor-rect corrosion problems and lower copper discharge. W72-12188

LAKE SUPERIOR PERIPHYTON IN RELATION TO WATER QUALITY, Minnesota Univ., Minneapolis. T. A. Olson, and T. O. Odlaug.

Copy available from GPO Sup Doc as EPA 18050 DBM 02/72 for \$2.00; microfiche from NTIS as PB-211 185, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1972. 253 p, 171 fig. 41 tab, 7 ref, 4 append. EPA Program 18050 DBM 02/72 (formerly WP-00828).

Descriptors: *Chlorophyll, *Plant pigments, Aquatic productivity, *Primary productivity, *Algae, *Diatoms, *Periphyton, *Phytoplankton, *Sessile algae, *Lake Superior, Limnology, Fertility, Photosynthesis, Respiration, Eutrophication, Plant population, Classification, Sampling, Chlorophyta, *Chrysophyta, Cyanophyta.

Laboratory and field studies were conducted to evaluate the importance of periphyton in western Lake Superior with special reference to the make-up and distribution of the periphyton growths and to the overall importance of productive capacity of

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05 Effects of Pollution—Group 5C

this assemblage of organisms. The taxonomic portion of the investigation indicated that over 90% of the total number of organisms were diatoms and that the phyla to which these diatoms belonged were the Chrysophyta, the Chlorophyta, and the Cyanophyta. Predominant genera were Synedra, Achnanthes, Navicula, Cymbella, and Comphonema. In many respects, the periphyton of Lake Superior was similar to that found in streams and there was evidence that the interrelated factors that affected periphyton growths were temperature, light intensity, depth of water, water movements, nutrient levels, and the type of substrate. Artificially denuded rocks demonstrated definite re-growth but after 46 days this growth level was only 18% of that occurring naturally. The mean total counts of organisms in the primary sampling area ranged from 497,000 to 1,470,000 per square centimeter of rock surface. Studies of the pigment concentrations showed that the biomass of periphyton along the North Shore of Lake Superior resemble those of other oligotrophic bodies of water and range from 0.338 to 3.59 mg of total pigment per 100 square centimeters of rock surface. The average was 1.36 mg per 100 square centimeters of rock surface. The average was 1.36 mg per 100 square centimeters of rock surface. Pigment ratios indicated that the Lake Superior periphyton was dominated by the Chrysophyta.

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CONCENTRATION FACTORS FOR RADIONUCLIDE UPTAKE BY BIOTA OF THE RIVER GARIGLIANO (DETERMINAZIONE DI FATTORI DI CONCENTRAZIONE IN COMPONENTI ABIOTICI E BIOLOGICI DEL FIUME GARIGLIANO), Comitato Nazionale per l'Energia Nucleare, Cassaccia (Italy). Laboratorio Radioattivita Ambientale.

tale.

A. Antonelli, M. Castaldo, L. Cigna Rossi, U. Laneri, and R. Pagnotta.

Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 15 p, 7 tab, 8 ref.

Descriptors: *Nuclear powerplants, *Nuclear wastes, *Radioactivity effects, *Water pollution effects, Estuarine environment, Cobalt radioisotopes, Food chains, Fish, Crustaceans, Gastropods, Vegetation, Radioecology, Absorption

Identifiers: Cesium radioisotopes, *Garigliano

Discharges from a nuclear powerplant to the Garigliano River produced measurable effects in the estuary about 12 kilometers downstream. From measurements on samples and from an estimate of the radioactivity of the water (based on monthly values of the radionuclides discharged and the average river flow rate), concentration factors were calculated - fish: Co, 25-55; Cs, 300-700 - crustaceans: Co, 800-4600 - gastropods: Co, 3500-13,000 - sediment: Co, 4000-6400 - plants: Co, 14,000-16000. (Bopp-ORNL)

EFFECTS OF ACUTE BETA AND GAMMA RADIATION ON DEVELOPING EMBRYOS OF CARP (CYPRINUS CARPIO), Oak Ridge National Lab., Tenn. Health Physics

B. G. Blaylock, and N. A. Griffith. Radiation Research, Vol 46, p 99-104, 1971. 2 tab,

Descriptors: *Carp, *Growth stages, *Radioactivi-ty effects, Water pollution effects, Radiosensitivi-ty, Lethal limit. Identifiers: *Cyprinus carpio.

The one-cell stage of the developing carp eggs was relatively resistant to both acute beta and gamma

radiation (LD50 doses were 500.5 rads for beta and 601.3 rads for gamma radiation). Dose rates were 7.1 rads/sec for gamma radiation and 1.4 rads/sec for beta radiation; thus for a dose of 1000 rads the developing eggs would be exposed for 2.3 minutes for a gamma dose and 11.9 minutes for a beta dose. Although the eggs would still be in the one-cell stage following a 1000-rad dose of beta radiation, this is a very active stage of development shortly before cell division and the radiation sensitivity of the egg could change rapidly. (Bopp-ORNL) W72-12220

EXPERIMENTAL-ECOLOGICAL INVESTIGA-TIONS ON PHAEOCYSTIS POUCHETI (HAP-TOPHYCEAE): CULTIVATION AND WASTE WATER TEST, Biologische Anstalt Helgoland (West Germany). H. Kayser. Helgolander wissenschaftliche suchung, Vol 20, p 195-212, 1970. 13 fig, 6 ref.

Descriptors: *Marine algae, *Laboratory tests, *Chemical waste, *Growth rates, *Seawater, *Toxicity, *Nutrients, Lethal limits, Methodology, Industrial wastes, Domestic wastes, Bioassay, Sulfates, Iron compounds, Sewage, Nitrates, Phosphates. Identifiers: Silt-water-plant relationships, North Sea, Phaeocystis spp., Soil cultures, Titanium dioxide wastes, Helgoland.

The influence of light, temperature, nutrients, industrial and domestic wastes on the alga, Phaeocystis poucheti, under laboratory conditions was observed. The multiplication rates of the various stages in soil, nitrate and phosphate solutions, and seawater solutions under various cultural methods was determined. Industrial waste water (consisting primarily of H2SO4 and FeSO4) from a titanium dioxide factory favors the growth of the colony stage of P. poucheti in a dilution of 1 part waste water to 100,000 parts of nutrient medium. A dilution of 1:4000 significantly reduces the multiplication rates of colonies. A dilution of 1:2250 is lethal. Unfiltered domestic sewage in concentrations of 1-5 parts of sewage to 1000 parts of sea water results in a vigorous development of the colonies. The single cell stage shows slightly increased multiplication rates all of the time. Ten parts of sewage to 1000 parts seawater results in toxicity to both stages. (Katz-Washington)

MODIFICATION OF SOME PHYSIOLOGICAL METHODS FOR ESTIMATION OF WATER QUALITY AND THEIR RELATIONSHIP TO DEGREES OF SAPROBITY (MODIFIKACE VYBRANYCH FYZIOLOGICKYCH METOD STANOVENI KVALITY VODY A JEJICH VZTAH K STUPNUM SAPROB ITY), Vysoka Skola Chemico-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology. D. Matulova.

D. Matulova.

Vodni Hospodarstvi, Vol 9, p 393-395, 1967. 1 tab, 18 ref. English summary.

Descriptors: *Water quality, *Bioindicators, *Water analysis, *Bioassay, *Comparative productivity, Aquatic microbiology, Eutrophication, Municipal wastes, Freshwater algae, Water pollution effects, Domestic wastes, Industrial wastes, Environmental effects, Analytical techniques, Physiological ecology, Plant physiology.

gy.

Identifiers: *Algal culture, *Biomass titer,
*Biological index, *Saprobity, Prague,
Czechoslovakia, Laboratory procedures, Statistical procedures, BMT.

Studies were made with sewage and industrial wastes collected from several areas near Prague, especially where the Botic empties into the River Vitava, to determine its effect on algae. A

technique was developed to evaluate its toxicity to algae. On the basis of results obtained using the biomass titer (BMT) as a criterion, a biological index of water quality was obtained. The index enabled the calculation of different degrees of sarrobity. The values obtained by the laboratory experiments were compared with findings in the field. A good correlation of beta saprobic to polysaprobic waters was found. (Katz-Washington)

INFLUENCE OF DILUTED SEAWATER ON THE PHYSIOLOGICAL ACTIVITY OF BABY-NECK CLAM, VENERUPIS JAPONICA, AND THE TOXIC EFFECT OF A HERBICIDE PCP, PENTACHLOROPHENATE, K. Okubo, and T. Okubo. Bulletin of the Tokai Regional Fisheries Research Laboratory, No 44, p 31-40, October 1965. 6 fig, 7 tab, 12 ref. Japanese with an English summary.

Descriptors: *Pentachlorophenate, *Water pollution, *Brackish-water fish, *Fish physiology, *Marine fish, *Clams, *Animal physiology, *Osmotic pressure, *Salimity, *Toxicity, *Bioassay, Fishkill, Benthic fauna, Mollusks, Water pollution effects lution effects.
Identifiers: Japan, Rainfall, Kyushyu, PCP, Pentachlorophenol, Body fluids.

A mass destruction of littoral fishes and clams occurred in early July, 1961 and 1962, on the coast of the Ariake Sea, Kyushu, Japan. It was reported to have taken place just after use of a herbicide (PCP), followed by a heavy rainfall. Laboratory experiments mainly on osmotic pressures of body fluids of V. japonica and the toxic effect of PCP were carried out. The osmotic pressures of body fluids of V. japonica are easily balanced with those of diluted seawater, but they never decrease beyond the threshhold value corresponding to the concentration of seawater, i.e. 5.5 ppt chlorinity. In seawater of about 5.5 ppt chlorinity, the tolerance of V. japonica to PCP drops to one-tenth the normal value. With the recovery of chlorinity of the seawater to the normal level, the osmotic pressures of body fluids and physiological activity of V. japonica resume rapidly. (Katz-Washington) W72-12241 A mass destruction of littoral fishes and clams oc-

SHRIMPS IN RELATION TO OXYGEN DEPLE-TION AND ITS ECOLOGICAL SIGNIFICANCE IN A POLLUTED ESTUARY, King's Coll., London (England). R. Huddart, and D. R. Arthur. Environmental Pollution, Vol 2, p 13-35, 1971. 10

fig, 1 tab, 10 ref.

Descriptors: "Shrimp, "Dissolved oxygen, *Estuarine environment, "Water pollution effects, Oxygen sag, Migration, Ecology, Computer models, Mathematical models, Bioassay. Identifiers: Oxygen depletion, Tidal currents.

There is a substantial body of evidence that the lack of shrimp at any one time during their season is associated with low oxygen tension of Thames River estuarine water. A major effect of reducing the oxygen tension for shrimp is stimulated swimming, during which they move upward more vertically through the water. The ecological implications in a polluted estuary are that the higher the vertical height attained by the shrimp the longer they take to sink passively downward. The longer they take to sink passively downward the longer they take to sink, the greater will be the distance covered horizontally when they are transported by the tidal current, and the faster the current the greater will be this distance. Within the context of the tidal Thames with its 14.5-km tidal excursion, the results have been computer-simulated and a the results have been computer-simulated and a model of shrimp migration suggested. (Svensson-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C-Effects of Pollution

EFFECT OF HEAVY METALS ON MORTALI-

TY AND GROWTH, Queen Mary Coll., London (England). B. Brown, and M. Ahsanullah. Marine Pollution Bulletin, Vol 2, No 12, p 182-188, December 1971. 7 fig. 4 tab, 17 ref.

Descriptors: *Heavy metals, *Mortality, *Growth rates, Mercury, Copper, Cadmium, Iron, Lead, Bioassay, Aquatic animals, Toxicity, Brine shrimp, Worms, Larvae, Water pollution effects,

Identifiers: *Sublethal effects, Artemia spp., Ophryotrocha spp.

Toxicity of heavy metals is usually measured in acute tests, but in a natural situation their sublethal effects may be at least as damaging. The effect of heavy metals on the growth rate of a worm and a brine shrimp, as well as on their mor-tality, are discussed. (Svensson-Washington)

NITROGEN GAS BUBBLE DISEASE RELATED TO A HATCHERY WATER SUPPLY FROM THE FOREBAY OF A HIGH-HEAD RE-REG-ULATING DAM,

Oregon Fish Commission, Clackamas. E. J. Wyatt, and K. T. Beiningen.
Fish Commission of Oregon Research Report 3, p
3-12, November 1971. 3 fig, 1 tab, 11 ref.

Descriptors: *Nitrogen, *Fishkil, *Fish diseases, Pathology, Bioassay, Mortality, Fish hatcheries, Salmonids, Forebays, Dams, Chinook salmon, Water chemistry, Hydraulic properties, Fish behavior, Water pollution effects, Water pollution Sources, Water pollution.

Identifiers: *Gas bubble disease, Nitrogen super-saturation, Embolism, Foster dam, Steelhead,

Fish pathology.

Studies of the water supply system at the Fish Commission of Oregon's South Santiam River Hatchery were made following the loss of nearly a half million salmonid fishes due to gas embolism. Hatchery water from the forebay of adjacent Foster Dam had become supersaturated with dis-solved nitrogen as the result of air entering the supply system. Experiments revealed that fish were exposed to concentrations in excess of 150% were exposed to concentrations in excess of 150% of saturation and rapidly died from the effects of gas bubble disease. Biological assay data regarding supersaturation rates, exposure times, death rates, and gross pathology are reported. (Svensson-Washington)
W72-12244

EFFECTS OF PETROLEUM MICROORGAN-ISMS, AS DIET, UPON THE GROWTH RATE AND BLOOD PROPERTIES OF SEA BREAM, CHRYSOPHRYS MAJOR TEMMINCK AND SCHLEGEL, Hiroshima Univ. (Japan). K. Nanba, S. Murachi, C. Kitajima, and T.

Matsuzato.

Journal of the Faculty of Fisheries and Animal Husbandry, Hiroshima University, Vol 10, No 1, p 21-27, July 1971. 1 fig, 4 tab, 12 ref.

Descriptors: *Fish diets, *Fish food organisms Aquatic microorganisms, Growth rates, Fish physiology, Bioassay. Identifiers: *Petroleu

Identifiers: *Petroleum microorganisms, Blood properties, Sea bream, Cholesterol, Chrysophrys

Investigations have been carried out in order to see the effects of the introduction of petroleum see the effects of the introduction of perforcing microorganisms in the diet of cultivated marine fishes. Sea bream were used as the experimental fish. Studies were made by comparing the growth rates and blood properties of fish under two types of feeding, i.e. feeding on a diet containing petrole-um microorganisms vs. a diet of fish meal alone. (Svensson-Washington) W72-12245 MORPHOLOGICAL CHARACTERS OF YOUNG BREAM INHABITING THE ZONE AFFECTED BY THE WASTE WATER OF THE KONAKOVO

POWER STATION, Gosudarstvennyi Nauchno-Issledovatelskii In-stitut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR). T. S. Zhiteneva.

Journal of Ichthyology, Vol 11, No 3, p 439-443, 1971. 1 fig, 2 tab, 12 ref.

Descriptors: *Fish physiology, *Heated water, *Water pollution effects, Water temperature, Power plants, Aquatic environment, Thermal pol-Power plants, Aquatic environment, Thermal pol-lution, Water quality, Fish populations, Reser-voirs, Water water (Pollution). Identifiers: Bream, Morphological characters, Morphological ratios.

A comparative study of the morphology of the bream (Abramis brama orientalis) was made to evaluate the effects from the discharge of heated waters from the Konakovo power station into Ivan'kovo reservoir. Young bream 2+ yrs old in-habiting the zone of waste water are characterized by a lower figure of relative body depth than the young bream from other areas of the reservoir. This is explained by the adverse feeding condirus is explained by the adverse record condi-tions for the bream in the zone of waste water from the power station. The morphological fea-tures which distinguish young bream of the warm water zone from the young of other areas of the reservoir (low body depth, greater range of variation in the relative magnitude of a number of characters) justify the assumption that the young bream keep to permanent feeding grounds in the spring, summer and fall, and that one of these is the warm water zone. (Svensson-Washington)

WATER QUALITY OF SOME LOGGED AND UNLOGGED CALIFORNIA STREAMS, California State Dept. of Fish and Game, Sacra-mento. Inland Fisheries Branch. For primary bibliographic entry see Field 04C. W72-12248

AN ESTIMATE OF MORTALITY OF CHINOOK SALMON IN THE COLUMBIA RIVER NEAR BONNEVILLE DAM DURING THE SUMMER RUN OF 1955, Bureau of Commercial Fisheries, Auke Bay,

Alaska. Biological Lab.
T. R. Merrell, Jr., M. D. Collins, and J. W.

US Fish Wild Serv Fish Bull. Vol 68, No 3, p 461-

492. 1971. Illus. Maps. Identifiers: Bonneville Dam, *Columbia River, *Mortality, Oncorhynchus-Tshawytscha, *Chin-

ook salmon.

In 1955 the Oregon Fish Commission estimated the numbers of dead chinook salmon, Oncorhynchus shawytscha, near Bonneville Dam and studied the probable causes of death. The estimates of numbers of dead fish were made from ratios of tagged to untagged floating carcasses below the dam. Tagged salmon carcasses were released at the and the river below the dam was searched systematically to recover tagged and untagged car-casses. The introduced tagged carcasses and the untagged carcasses of fish that died in the river were assumed to have equal chances of recovery, provided they were not too severely mutilated to be recoverable. This assumption was verified ex-perimentally. On June 30 and July 1, 1955, when riverflows were relatively high, 1169 tagged chin-ook salmon carcasses were released at Bonneville Dam. Thirty-one tagged and 117 untagged carcasses were recovered in searches down-stream from the release point. On the basis of these recoveries, an estimated 4412 summer-run chinook salmon died near the dam between June 21 and July 10. On the basis of this estimate, 16.8% of the total chinook salmon run died at Bonneville Dam in this period. The numbers of floating carcasses in 1954 and 1955 were directly related to spillway discharge; greatest numbers of floating dead fish coincided with Columbia River flows in dead isin confidence with continuous and the state of the excess of 7100 c.m.s. (m cu/sec). At Bonneville Dam fall chinook salmon runs have never been subjected to flows above 7100 c.m.s. (killing flows); spring runs are exposed to such flows in some years; and summer runs nearly always en-counter such flows. Water temperature, turbidity, dity, disease, and injuries from gill nets did not affect the number of carcasses. Although the specific causes of death and the precise areas at Bonneville Dam where death occurred were not determined in our study, the major source of chinook salmon mortality was associated with the spillway during high flows. Other investigators subsequently demonstrated that during high flows the Columbia River that has plunged over dam spillways in supersaturated with atmospheric N. This supersaturated with atmospheric N. ration may be one of the principal causes of death of fish at mainstream dams. Bonneville Dam is only about 18.3 m high, and hundreds of thousands of salmon successfully negotiate the fishways each yr; yet many salmon are killed during periods of high flow. Complacency about the efficiency of salmon passage over large dams is, therefore, un-warranted, even when elaborate well-designed passage facilities are present and few dead or in-jured fish are noticed.—Copyright 1972, Biological Abstracts, Inc. W72-12250

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A PROPOSED BIOCHEMICAL MECHANISM OF THE TOXIC ACTION OF DDT, Illinois Natural History Survey, Urbana.

R. C. Hiltebran. Transactions of the Illinois State Academy of Science, Vol 64, No 1, p 46-54, 1971. 2 tab, 44 ref.

Descriptors: *DDT, *Pesticide toxicity, *Enzymes, *Fish physiology, *Bioassay, *Inhibitors, Pesticides, Insecticides, Biochemistry, Metabolsm, Oxygen, Freshwater fish, Magnesium, Manganese, Pesticide kinetics, Chlorinated hydrocar-

ganese, Pesticide kinetics, Chiorinateu nyuroca-bon pesticides. Identifiers: *Biochemical mechanisms, *Bluegills, Succinate, Mitochondria, Alpha-ketoglutarate, Adenosinetriphosphate.

DDT at 5.9 x 0.0001 g/ml of reaction medium inhibited oxygen uptake by bluegill liver mitochondria in the presence of succinic acid. DDT increased the hydrolysis of adenosinetriphosphate in the presence of magnesium and magnesie ions. A biochemical mechanism of the toxic action of DDT is suggested. (Svensson-Washington) W72-12251

SEASONAL CHANGES OF THE HETEROTROPHIC MICROFLORA OF THE ILAWA LAKES BOTTOM DEPOSITS, Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Po-

S. Niewolak

Polskie Archiwum Hydrobiologii, Vol 15 (28), No 3, p 211-224, 1968. 5 fig, 2 tab, 42 ref.

Descriptors: *Aquatic microorganisms, *Bottom sediments, *Seasonal, *Annual succession, Aquatic bacteria, Aerobic bacteria, Spores. Identifiers: *Ilawa Lakes (Poland), Heterotrophic bacteria, Poland, Spore forming bacteria Proteolytic bacteria, Sandy bottom, Mud bottom.

The distribution of the heterotrophic microflora in the bottom sediments of the llawa lakes depends mainly on the bottom type. The total number of heterotrophic bacteria, aerobic spore forming bacteria, proteolytic bacteria, as well as those liberating ammonia is higher in bottom deposits of the muddy type, lower in sandy bottom deposits. Seasonal fluctuations in the development of heterotrophic bacteria display a regularity, that is maximum numbers of bacteria occur in the vegetative period, minimum numbers in winter. The bot-

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Effects of Pollution—Group 5C

tom deposits of the lake Jeziorak Maly, which is polluted with industrial effluents and farm sewage, contain a heterotrophic flora greater in number, the maximum of bacteria occurring at different seasons, sometimes also in winter. (LeGore-Washington) W72-12254

THE INFLUENCE OF ALCOHOL EXTRACTS OF SOME ALGAE (CHLORELLA AND SCENEDESMUS) ON AQUATIC MICROORGANISMS,

Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). S. Niewolak.

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of the posits. ent of that is Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 31-42, 1971. 1 fig, 3 tab, 25 ref.

Descriptors: *Algal toxins, *Inhibition, *Chlorella, *Scenedesmus, Aquatic microorganisms, Aquatic bacteria, Aquatic algae, Algae, Chlorophyta, Pseudomonas, Enteric bacteria. Identifiers: Bacillus, Micrococcus, Gram negative

Alcohol extracts of algae of the general Chlorella and Scenedesmus inhibit the development of about 20% of water microorganisms. Particularly vulnerable are Gram-positive bacteria of the genera Micrococcus and Bacillus. Among the Gram-negative bacteria, the greatest number of vulnerable strains can be found in the Pseudomonas group and in the Enterobacteriaceae family. Chlorella extracts have more extensive scope of antagonistic action than have samy. Chlored extracts have more extensive scope of antagonistic action than have Scenedesmus extracts. The latter, however, are more active and they inhibit the growth of bacteria in larger areas. (LeGore-Washington) W72-12255

A WINTER SPORT FISHING SURVEY IN A WARM WATER DISCHARGE OF A STEAM ELECTRIC STATION ON THE PATUXENT RIVER, MARYLAND, Benedict Estuarine Lab., Md. C. J. Moore, and C. M. Frisbie. Chesapeake Science, Vol 13, No 2, p 110-115, June 1972. 2 fig, 3 tab, 4 ref.

Descriptors: *Winter sports, *Fishing, *Sport fishing, *Creel census, *Thermal pollution, *Water temperature, Warm-water fishing, Recreation, Heated water, Water pollution effects, Thermal powerplants, Maryland, Discharge (Water), Review, White perch, Thermal water, Water pollution sources, Steam turbines, Electric power, Outlets, Maryland.

Identifiers: Warm water discharge, Patuxent River (Maryland), Discharge canal, Fishing intensity, Fishing pressure, Catch per unit effort, Morone

An interview-count sport fishing survey was conducted from January through April, 1970, along a one mile discharge canal of the Potomac Electric Power Company's Steam Electric station located at Chalk Point, Maryland. The study was to investigate the fishery in a warm water discharge. An estimated 20,335 fishing trips, representing 77,943 hrs of fishing, were made during the period sampled. On interview days, 8,758 fishermen were counted, and 4,716 were interviewed. An estimated 58,453 fish, representing 9 species, were taken, with an average of 0.71 fish caught per manhour of effort. White perch, Morone americana, dominated the catch during all months sampled. No significant correlation could be made between water temperature of the canal and number of fish caught per man-hour of effort. (Katz-Washington) W72-12256

TOXICITY OF MERCURY COMPOUNDS TO AQUATIC ORGANISMS AND ACCUMULA-

TION OF THE COMPOUNDS BY THE ORGAN-ISMS, Freshwater Fisheries Research Lab., Tokyo

(Japan). Y. Matida, H. Kumada, S. Kimura, Y. Saiga, and

Bulletin of the Freshwater Fisheries Research Laboratory, Vol 21, No 2, p 197-227, 1971. 4 fig, 11 tab, 33 ref.

Descriptors: "Mercury, "Public health, "Shellfish, Water pollution effects, Toxicity, Water pollution, Food chains, Path of pollutants, Bioassay, Fish, Rainbow trout, Aquatic life, Aquatic environment, Fish physiology, Algae, Daphnia. Identifiers: "Mercury compounds, "Minamata Disease, Biological magnification, Minamata Bay (Japan), Organic mercury compounds, Biosynthesis, Gurnnes.

This study confirmed that fish feeding on mercury-contaminated organisms from Minamata Bay, Japan, suffer from mercury poisoning. The results of studies of chronic toxicity to fish of toxic shellfish containing some methyl mercury compounds and of various mercury compounds are discussed. In addition, the results of some experiments on biological magnification of mercury compounds through the food chain from phytoplankton to fish, and on biosynthesis of organic mercury from inorganic mercury are considered. (Svensson-Washington)

THE INFLUENCE OF INCUBATION TEM-PERATURE ON TOTAL COUNTS OF BAC-TERIA IN WATER (WPLYW TEMPERATURY INKUBCJI WYSIEWOW NA OZNACZANIE OGOLNEJ LICZBY BAKTERII W WODZIE), Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Po-land), Katedra Mikrobiologii Technicznej.

Zeszyty Naukowe Wyzszej Szkoly Rolniczej w Olsztynie, Vol 23, No 581, p 513-521, 1967. 2 tab,

Descriptors: *Aquatic bacteria, *Water tempera-ture, *Temperature, Aquatic microorganisms, In-cubation, Seasonal, Annual succession. Identifiers: *Incubation temperature, *Ilawa Lakes (Poland), Lake water, Poland.

Studies were carried out on the influence of incubation temperature on total counts of bacteria in lake water of the Ilawa region, when inoculated and grown on broth-agar medium at 20 and 26C. Considerable variations in bacterial counts were found in summer and in winter as determined at tound in summer and in winter as determined at the above mentioned temperatures. The same is true regarding the morphological composition of the microflora determined. The total year counts of bacteria were, however, only 10% higher when incubated at 20C (for 7 days) than when incubated at 26C. These differences were statistically insig-nificant. (LeGore-Washington) W72-12258

MICROBIOLOGICAL CHARACTERIZATION OF GROUND DEPOSITS IN THE LAKES OF THE DISTRICT OF ILAWA IN THE YEARS OF 1960-1963 (CHARAKTERYSTYKA MIKROBIOLOGICZNA OSADOW DENNYCH JEZJOR ILAWSKICH W LATACH 1960-1963), Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). Katedra Mikrobiologii Technicznej. S. Niewolak. Zeszyty Naukowe Wyzszej Szkoly Rolniczej w Olsztynie, Vol 26, No 784, p 613-635, 1970. 7 fig, 6 tab, 43 ref.

Descriptors: *Aquatic microorganisms, *Aquatic bacteria, *Bottom sediments, *Seasonal, *Annual succession, Aerobic bacteria, Spores. Identifiers: *Ilawa Lakes (Poland), Poland, Spore forming bacteria, Sandy bottom, Clay bottom, Gram negative bacteria, Gram positive bacteria.

Microbiological studies of Lakes Jeziorak Maly and Jeziorak (Poland) were carried out. Clay bottoms contained more bacteria than did sandy bottoms. Seasonal variations in the counts of saprophytic and proteolytic bacteria reached their highest values in summer and autumn, when the accumulation of organic substances considerably increased. Gram-positive bacilli dominated among the bacteria. Average percentages of cocci and Gram-negative bacteria were 30% and 18-30%, respectively. Spore-forming bacteria seemed very scarce in the lakes studies. (LeGore-Washington) W72-12259

UPTAKE OF POLYCHLORINATED BIPHEN-YLS FROM SEA WATER BY GAMMARUS OCEANICUS, Fisheries Research Board of Canada, St. Andrews (New Brunswick). D. J. Wildlish, and V. Zitko. Marine Biology, Vol 9, No 3, p 213-218, May 1971. 5 fig, 6 tab, 13 ref.

Descriptors: *Absorption, *Polychlorinated biphenyls, *Arcolors, Sea water, Industrial wastes, Crustaceans, Weight, Feeding rates, Animal metabolism.

Identifiers: Gammarus spp., Intermolt, Aroclor 1254, Corexit 7664, Body weight, Surface area,

The uptake of a polychlorinated biphenyl preparation containing 5-7 chlorine atoms per molecule, solubilized in a nonionic surfactant in sea water, by Gammarus oceanicus was measured spectrophotometrically. Uptake occurred in living animals across the general integument. It is suggested that uptake rates are dependent upon the total surface area of the integument, although no accurate method of determining this is known. The rate of uptake decreased after 4-6 hr exposure and uptake was dependent upon concentration of polychlorinated biphenyls in sea water. The stage of the intermolt of 6. oceanicus did not affect uptake rates. (Katz-Washington)

POLYCHLORINATED BIPHENYLS (PCB) IN SEA WATER AND THEIR EFFECT ON REPRODUCTION OF GAMMARUS

REPRODUCTION OF GAMMARCS OCEANICUS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
D. J. Wildlish.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 182-187, 1972. 4 tab, 8

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Sea water, *Reproduction, *Lethal limit, Bioassay. Identifiers: *Gammarus spp., *Aroclor 1254, *Median lethal time, Short-term exposure, Corexit 7664, Static bioassay, Mating success, Detoxifica-

A study was made on the effect of short-term exposure to PCB in sea water on the median lethal time and reproductive performance of Gammarus oceanicus. Exposure of the organism to 0.2 mg/l of Aroclor 1254 solubilized in Corexit 7664 in sea water for 10 hr produces and LT-50 of 35.1 days. No significant biological detoxification is indicated. Effects on mating success is interpreted as responses of the male to impending death caused by PCB poisoning. (Katz-Washington) W72-12263

EFFECTS OF FOUR INSECTICIDES ON THE ABILITY OF ATLANTIC SALMON PARR (SALMO SALAR) TO LEARN AND RETAIN A SIMPLE CONDITIONED RESPONSE, Queen's Univ., Kingston (Ontario). C. T. Hatfield, and P. H. Johansen. Journal of the Fisheries Research Board of Canada, Vol 29, p 315-321, 1972. 5 fig, 14 ref.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

Descriptors: "Insecticides, "Fish behavior, *Laboratory tests, "Atlantic salmon, "DDT, Pesti-cides, Chlorinated hydrocarbon pesticides, Or-ganophosphorous pesticides, Water pollution ef-fects, Lethal limit.

Identifiers: *Learning ability, *Conditioned response, *Sumithion, *Acetone, Methoxychlor, LC50, Sublethal effects.

The learning ability of untreated, acetone-treated, and insecticide-treated Atlantic salmon parr was determined in a shuttlebox conditioning apparatus. Learning improvement on second conditioning was also tested. The results were that: (1) acctone did not affect learning; (2) with treatment for 24 hr at the 96 hr LC50 Sumithion completely inhibited learning, Abate retarded learning, DDT mildly enhanced learning, and methoxychlor was without a detactable affect; (3) when Abate and methors. a detectable effect; (3) when Abate and methoxychlor-treated salmon in item (2) above were retrained 1 or 7 days later, their learning ability improved, but DDT-treated fish showed no improvement; (4) four days of recovery from a 24 hr expo-sure to the 96 hr LC50 of Abate or Sumithion still resulted in slow learning ability, although after 7 days of recovery, learning rate was the same as in controls; (5) insecticide treatment at the 96 hr controls; (3) insecticide treatment at the 96 hr LC50 level for 24 hr interposed between first and second conditioning had little or no effect on learning ability; (6) insecticide concentrations at 1/10 the 96 hr LC50 or lower had no effect on learning ability. (Katz-Washington) W72-12264

SOME ASPECTS OF THE CHEMISTRY AND ACUTE TOXICITY OF THE IRON ORE FLOTA-TION AGENT DIMETHYL AMMONIUM ALKYL HYDROXAMATE AND SOME RELATED COMPOUNDS TO BROOK TROUT, Bedford Inst., Dartmouth (Nova Scotia).

G. L. Fletcher, and R. F. Addison.
Bulletin of Environmental Contamination and
Toxicology, Vol 7, No 2/3, p 147-159, 1972. 2 fig, 4
tab, 15 ref.

Descriptors: *Brook trout, *Bioassay, *Water pol-lution effects, *Water temperature, Toxicity, Flotation, Freshwater, Alkalis (Bases), Tempera-ture, Lethal limit, Aquatic environment, Water

quality, Industrial wastes. Identifiers: *Dimethyl ammonium alkyl hydroxamate, *Hydroxylamine, *Hydroxamate group, Acute toxicity, Ore flotation agents, Salvelinus spp., Static bioassay, Continuous flow bioassay.

Dimethyl ammonium alkyl hydroxamate (DMAH) was lethal to brook trout (Salvelinus fontinalis) at concentrations as low as 4.5 mg/l. Since DMAH consisted of a number of molecular species in consisted of a number of molecular species in equilibrium, experiments were conducted with several of them in an attempt to evaluate their contribution to its toxicity. Of the compounds tested, dimethylamine proved to be non-toxic, hydroxylamine was as lethal as DMAH (on a molar basis) and NaClO hydroxamate was 5-10 times more toxic than hydroxylamine of DMAH. Although hydroxylamine may have played a small part in the toxicity of DMAH, the hydroxamate group appeared to be the major lethal component. (Katz-Washington)

A LABORATORY APPARATUS FOR MAIN-TAINING UNIFORM SUSPENSIONS OF FINE-

GRAINED SEDIMENT,
Johns Hopkins Univ., Baltimore, Md.
J. R. Schubel, E. W. Schiemer, and G. M. Schmidt.
Chesapeake Science, Vol 13, No 2, p 154-156,
June 1972. 5 fig, 1 ref. NMFS AFC 5-1.

Descriptors: *Methodology, *Suspended solids, Laboratory equipment, Laboratory tests, Bioas-say, Sediment load, Turbidity, Particle size, Aquatic life, Aquaria.

Identifiers: *Continuous flow bioassay, Sediment suspensions, Fine-grained Homogenous suspensions.

An apparatus was designed and built for maintaining and renewing uniform suspensions of fine-grained sediment for laboratory experiments on the effects of suspended sediment on organisms. The suspensions are maintained with vertically reciprocating perforated plates driven by gearmo-tors. Suspensions with concentrations of up to 500 mg/l were maintained to within about 15% of their mean concentration for 5-7 days. The suspensions were completely replaced every 24 hr by periodic additions. The particles had a mass-weighted mean settling velocity of about 0.005 cm/sec. (Katz-Washington) Washington) W72-12266

HISTOPATHOLOGIC LESIONS IN CUTTHROAT TROUT (SALMO CLARKI) EXPOSED CHRONICALLY TO THE INSECTICIDE

ENDRIN, Bureau of Sport Fisheries and Wildlife, Columbia,

L. L. Eller. American Journal of Pathology, Vol 64, No 2, p 321-336, 1971. 9 fig, 34 ref.

Descriptors: *Insecticides, *Endrin, *Chlorinated hydrocarbon pesticides, *Pathology, Cutthroat trout, Water pollution effects, Fish physiology, Gonads, Reviews.
Identifiers: *Chronic exposure, *Gill damage, Histopathology, Fish pathology, Lersions, Lesions, Salmo spp., Gill, Liver, Pancreas, Brain, Hepatic lesions, Degenerative syndrome, Pancreatic islets, Oocytes, Literature review.

Pathological conditions associated with exposure ratinological condutions associated with exposure to endrin were found in the gill, liver, pancreas, brain and gonad of cutthroat trout. Edema, hemorrhage and possible intracapillary congestion characterized gill damage after exposure to the highest level of endrin in the bath. Hepatic lesions nignest level of endrin in the bath. Hepatic lesions in young trout were of a type frequently described as preceding the development of hepatomas in nutritionally deficient fish. The increased incidence and severity of hepatic degenerative changes observed in fish exposed to high levels of endrin suggested nutritional deficiency enhanced by exposure to endrin. Marked hyperplasia of pancreatic islets and irregular, atypical oocytes were observed after exposure to high endrin levels. (Katz-Washington) W72-12267

POLYCHLORINATED BIPHENYLS: EFFECT OF LONG-TERM EXPOSURE ON ATPASE A TIVITY IN FISH, PIMEPHALES PROMELAS, Minnesota Univ., St. Paul.

R. B. Koch, D. Desaiah, H. H. Yap, and L. K. Cutkomp.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 87-92, 1972. 2 tab, 14 ref. FWPCA 16030 EL.Z.

*Polychlorinated Descriptors: *Aroclors, *Enzymes, Laboratory tests, Metabol-ism, Animal metabolism, Inhibition, Pathology. Identifiers: *ATPase activity, *Brain tissue, *Kidism, Animai metaooism, inniotion, Pathology. Identifiers: *ATPase activity, *Brain tissue, *Kidney tissue, *Liver tissue, Long term exposure, Chronic exposure, Pimephales spp., Oligomycin, Enzyme inhibition, Fish tissue, Target tissue, Target organ, Tissue degeneration.

Fathead minnows were exposed to polychlorinated biphenyls, Aroclor 1242 and 1254, for several months. All fish showed responses of ATPase after exposure to Aroclors. Both inhibition and stimulation responses were observed for the different tissues tested. Brain was the only tisthe different tissues tested. Brain was the only tis-sue that showed only inhibition of oligomycin sen-sitive Mg (2+) ATPase after exposure to both Aroclors. Maximum inhibitory effect on the AT-Pases occurred with ARoclor 1242 on kidney tis-sue. Evidence indicates that ATPase inhibition may be the specific mechanism of PCB attack on fish tissues. (Katz-Washington) W72-12268 THE FATE AND EFFECTS OF FRESCON MOL-LUSCICIDE IN AQUATIC SYSTEMS, Shell Research Ltd., Sittingbourne (England). Woodtock Agricultural Research Centre.

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Schriftenreihe des Vereins fuer Wasser-, Boden-und Lufthygiene, Vol 34, p 95-107, 1970 (publ. 1971). 17 fig.

Descriptors: *Molluscicides, *Fish, *Bioassay, Pesticides, Aquatic plants, Mammals, Aquatic en-vironment, Aquatic habitats, Aquatic soils, Path of pollutants, Toxicity, Pesticide toxicity, Public health.

health.
Identifiers: *Frescon, *Acute toxicity, *Subacute
Aguatic ecology, toxicity, "Toxicity bioassays, Aquatic ecology, Degradation routes, Triphenylcarbinol, Chronic toxicity, Australorbis spp., Bulimus spp., Biomphelaria spp., Rasbora spp.

The side effects of Frescon molluscicide following its application in aquatic systems is described, in-cluding its degradation routes in plants, soils, fish and mammals. The effects of Frescon on plants, fish and insects are described. Frescon breaks fish and insects are described. Frescon breaks down readily to form triphenylcarbinol in waters, soils, and plants and these compounds are of a low order of acute and subacute toxicity to mammals. Triphenylcarbinol is the main residue of environmental consequence. While Frescon and triphenylcarbinol are lipophilic they will not be stored in animal fat, since mammals convert them to hydroxylated derivatives, which are readily excreted. Frescon, triphenylcarbinol and morpholine are not toxic to plants. Frescon has some slight effects on some insects, but the other compounds have not. Frescon is toxic to some species of fish, but fishkills can be minimized by careful selection of the dosage rate and application technique. (Katz-Washington)

CHLAMYDOTHECA ARCUATA: AUTORADIO-GRAPHIC LOCALIZATION OF C-14-DI-

GRAPHIC LAURINGS CONTROL OF THE PROPERTY OF T

Descriptors: *Dieldrin, *Aldrin, Pesticides, Pesticide residues, Insecticides, Carbon radioisotopes, Crustaceans, Aquatic animals, Absorption, Chlorinated hydrocarbon pesticides, Animal metabolism, Animal physiology, Physiology. Identifiers: *Autoradiography, Sublethal effects, Ostracods, Chlamydotheca spp.

The uptake and storage of two chlorinated hydrocarbon insecticides, aldrin and dieldrin, in freshwater ostracods was studied using autoradiographic technique. Although aldrin and dieldrin uptake occurred over a wide body surface area, absorption was primarily through the body integment and the gut; lesser amounts of either insecticide were taken up through appendages. The shell absorbed or adsorbed only small quantities. The storage of these insecticides was largely in body lipids. (Svensson-Washington)

ACCUMULATION OF INSECTICIDE IN FRESHWATER OSTRACODS EXPOSED CON-TINUOUSLY TO SUBLETHAL CONCENTRA-TIONS OF ALDRIN OR DIELDRIN, South Dakota Univ., Vermillion. J. A. Kawatski, and J. C. Schmulbach.

Transactions of the American Fisheries Society, Vol 100, No 3, p 565-567, July 1971. 1 tab, 3 ref. OWRR A-015-SDAK (7).

Descriptors: *Dieldrin, residues, "Pesticide kinetics, "Path of pollutants, Pesticides, Insecticides, Pesticide toxicity, Bioassay, Crustaceans, Chlorinated hydrocarbon pesticides, Aquatic animals.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Waste Treatment Processes—Group 5D

Identifiers: *Sublethal effects, Ostracods, Chlamydotheca spp., Biological concentration, Accumulation of insecticides.

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Since they are essentially primary consumers of both dead and living organic matter, ostracods potentially have the capacity to concentrate insecticide residues from the substrate and water and to introduce or reintroduce the residues to organisms at higher trophic levels. Sublethal, long-term, laboratory exposures of ostracods to two chlorinated hydrocarbon insecticides (aldrin and dieldrin) have demonstrated that these animals can innocuously accumulate and store quantities of insecticides in excess of amounts which would be toxic if accumulated within shorter periods of time. (Svensson-Washington)

SAFETY CONSIDERATIONS FOR DETER-

GENTS, Proctor Gamble Co., Cincinnati, Ohio. Miami Val-ley Labs. For primary bibliographic entry see Field 05G. W72-12290

5D. Waste Treatment Processes

GROWTH RATE OF ASPIDISCIDAE ISO-LATED FROM ACTIVATED SLUDGE, Tokyo Univ. (Japan). Inst. of Applied Microbiolo-

gy. For primary bibliographic entry see Field 05C. W72-11796

ACCUMULATION OF METHANOGENIC SUBSTRATES IN CC14 INHIBITED ANAEROBIC SEWAGE SLUDGE DIGESTER CULTURES, Union Coll., Schenectady, N.Y. For primary bibliographic entry see Field 05C. W72-11816

FLOC-FORMING BACTERIA ISOLATED FROM ACTIVATED SLUDGE, Tohoku Univ., Sendai (Japan). Faculty of Agricul-

For primary bibliographic entry see Field 05A. W72-11827

THE FLOCCULATION OF ALGAE WITH SYNTHETIC POLYMERIC FLOCCULANTS, Connecticut Univ., Hartford. School of Medicine. R. C. Tilton, J. Murphy, and J. K. Dixon. Water Research, Vol 6, No 2, p 155-164, February 1972. 3 fig, 26 ref.

Descriptors: *Algae, *Flocculation, Water pollution :reatment, Colloids, *Polymers, Anions, Cations, Organic compounds, Separation techniques, Calcium, Magnesium, E. coli, Silica, *Filtration, Light pentration, Physical properties, Electrophoresis, Chemical properties, Hydrogen ion concentration, *Waste water treatment.

Identifiers: Polyacrylamides, Polystyrene sulfonate, Polyethyleneimine, **Chlorella ellipsoidia.

Samples of a pure algal culture of Chlorella ellipsoidia, at concentrations of 50-3000 mg/l, were subjected to polymer concentrations of 0.01-1000 mg/l at pH 4-7. A number of analytical methods were used in order to measure the flocculation of the algal culture by the synthetic polymeric flocculants. By employing a 9.6 sq cm Millipore membrane filter, the upper limit of polymer concentration above which filter blockage occurred was determined. In another test the degree of flocculation was measured by measuring the light transmitted by algal dispersion after polymer addition and settling. The flocculation efficiency was further analyzed by measurement of the electrophoretic mobilities of algal dispersions in a modified Briggs-type cell. A brief discussion was

also presented on a comparison of results on algae with those of other colloids, it being especially sig-nificant that at the same concentration of biocol-loid the algae need about 100 times higher concen-tration of polymer than does E. coli. (Mackan-Battelle) W72-11833

INDUSTRIAL WASTES AND WATER SUP-PLIES, Illinois State Water Survey, Urbana.

R. Evans.

Journal of the American Water Works Associa-tion, Vol 57, No 4, p 625-628, May 1965. 4 ref.

Descriptors: *Industrial wastes, *Water pollution sources, *Groundwater, *Waste disposal wells, *Water supply, *Lagoons, *Watershed management, *Water pollution sources, Monitoring, Illinois, Technology, Industries, Water quality control, Canneries, Sewage treatment, Accidents, Waste water treatment.

Identifiers: *Accidental spills, Technologic advances, Carbon chloroform extract, Petrochemical processors.

While most industries adequately treat their wastes, water utilities should recognize that the probability of breakdown of industrial treatment facilities is much greater than in the water indusfacilities is much greater than in the water industry. Safeguards may be too costly or be lacking due to management disinterest. Water utilities should be aware of deep-well disposal or lagoon systems which may affect the public water supply source. Technologic advances may affect industrial discharges through municipal waste treatment facilities because of the diverse nature of industrial waste products. The water utility must be responsible for watershed management that includes monitoring of industrial wastes. (Flack-AWWARF)

RELATION OF RIVER POLLUTION TO PUBLIC WATER SUPPLY IN EUROPE AND THE UNITED STATES, Amsterdam Water Works (Netherlands). For primary bibliographic entry see Field 05F. W72-11918

EFFECT OF FEED PROCESSING ON DIGESTI-BILITY OF ANIMAL FEEDS, Kansas State Univ., Manhattan H. B. Pfost. (1970) 21 p, 22 tab, 20 ref.

Descriptors: *Farm wastes, Feeds, Feed lots, Cat-tle, Microorganisms, Ammonia, Hogs. Identifiers: *Daily gain, Daily feed, Starch.

Some degree of starch gelatinization improves the feed efficiency for beef, swine and broiler feeding enough to be economically feasible under typical conditions in the United States. The utilization of urea in ruminant rations can be improved by use in combination with gelatinized starch. The results of combination with gelatinized starch. The results of using a highly gelatinized product for feeding swine appear interesting from a research standpoint and may prove to be practical later. Much of the past research which involved grain processing is difficult to interpret because of the failure to measure and report chemical and physical changes which occurred during processing. Standardized methods which are correlated with animal performance need to be developed. Protein availability must be considered as well as starch availability. Future developments in equipment for ty. Future developments in equipment for processing must consider the economic costs required to obtain desired levels or product change. (Bundy-Iowa State)

W72-11936 REGIONAL SEWAGE DISPOSAL PLANNING

ACT. For primary bibliographic entry see Field 06E. W72-11945

WATER POLLUTION CONTROL—SEWER AND DISPOSAL PLANT PROJECTS. For primary bibliographic entry see Field 06E. W72-11946

PROPOSED SEWAGE TREATMENT FACILI-TIES, SOLDOTNA, ALASKA (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Seattle, Wash.

Available from the National Technical Informa-tion Service as PB-204 662F, \$3.00 in paper copy, \$0.95 in microfiche. February 25, 1972. 50 p, 2

Descriptors: *Alaska, *Environmental effects, *Sewage treatment, *Water quality control, Al-ternate planning, Sewage effluents, Facilities, Ad-ministrative agencies, Governmental interrela-tions, Domestic water, Water management (Ap-plied), Project planning, Sewage disposal, Aera-tion, Chlorination, Waste water disposal, Waste water treatment. Identifiers: *Environmental Impact Statements, *Soldotra (Alas).

*Soldotna (Alas).

The project would consist of the construction of a sewage collection system in Soldotna, Alaska, including interceptor sewers, a sewage lift station, a new sewage treatment plant of extended aeration process design, and chlorination. Effluent will be discharged after disinfection into the Kenai River process design, and chlorination. Effluent will be discharged after disinfection into the Kenai River via an outfall approximately 21 miles upstream from the river's mouth. The only significant impact of the project is the effect on the quality of the waters receiving the treated discharge. The principal concern is for the potential public health hazard to the downstream city of Kenai in the withdrawal of water for drinking purposes, and the potential effect on present and future recreation and other related uses of the Kenai River. Alternatives considered include a regional system, various methods of ground water recharge for treated effluent disposal, discharge of treated effluent into Soldotna Creek, several different treatment processes at the selected site, provision of individual treatment units and small package plans, and no action. Included are problems and objections raised by federal, state, and local agencies and by private organizations in the review process and disposition of the issues involved. (Widman-Florida)

BIOMASS DETERMINATION - A NEW TECHNIQUE FOR ACTIVATED SLUDGE CON-TROL.

Biospherics Inc., Rockville, Md.

Copy available from GPO Sup Doc EPA 17050 EOY 01/72, \$1.25; microfiche from NTIS as PB-211 127, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, No 17050 EOY, January 1972, 116 p, 53 fig, 22 tab, 18 ref. EPA Program 17050 EOY 01/72.

Descriptors: "Activated sludge, "Analytical techniques, "Water quality, "Control, Monitoring, Suspended solids, "Biomass, Separation techniques, Laboratory tests, Pilot plants, On-site investigations, "Waste water treatment.

Identifiers: "ATP, "Process control, "Adenosine triphosphate.

Research was conducted to determine the feasi-bility of using adenosine triphosphate (ATP) as a measure of viable biomass in activated sludge. Methods were developed for the extraction of

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

ATP from sludge and mixed liquor, and for the determination of ATP using the firefly bioluminescent procedure. Measurements of ATP were conducted on various pure cultures, pilot plant and full-scale activated sludge treatment plants. Additional parameters including BOD, TOC, oxygen uptake rate, and suspended solids were measured to provide comparative and supportive informato provide comparative and supportive informa-tion. Preliminary tests in which ATP measurements of biomass were used to control the percent sludge return were conducted at two full-scale municipal sewage treatment plants. Lowered return e rates were found to produce effective treatment and increase the biological activity of the sludge. Changes in the rate of return sludge resulted in changes in ATP concentration of mixed liquor which preceded changes in suspended solids by as much as 24 hours. The assay was found to be reproducible and rapid. Results can be obtained within approximately ten minutes. (Lowry-Texas) W72-12006

THE PESTICIDE MANUFACTURING INDUS-TRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES,

Texas Univ., Austin. Dept. of Civil Engineering.

Copy available from GPO Sup Doc EPA 12020 FYE 01/72, \$1.50; microfiche from NTIS as PB-211 129, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 185 p, 35 fig, 25 tab, 86 ref. EPA Program 12020 FYE 01/72.

Descriptors: *Pesticides, *Industrial wastes, *Chemical wastes, Air pollution, Solid wastes, Landfills, Toxicity, Biodegradation, Cost analysis, *Waste water treatment, *Waste disposal, *Reviews.

Identifiers: *Pesticide chemistry, *Pesticide production, *Literature review.

An in-depth review of the literature, including government information documents, technical re-ports, the technical journals, industrial publica-tions, and twenty plant interviews with plant managers and operators were used as the data base for studying the 'state of the art' of pesticide manufacturing waste treatment and disposal practices. No attempts were made to prove or disprove statements made in the literature or statements made in the interviews. The report contains chapters dealing with: (a) the present and projected pesticide demands in the United States, (b) the chemistry of pesticides including production processes and waste generation, (c) waste treatment possibilities discussed in the literature, (d) pesticide waste treatment systems that have been or currently are in full scale operation, and (e) the cost of pesticide waste treatment system. (Lowry-W72-12009

ANAEROBIC TREATMENT OF SYNTHETIC ORGANIC WASTES,

Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
J. C. Hovius, J. A. Fisher, and R. A. Conway.

Copy available from GPO Sup Doc EPA 12020 DIS 01/72, \$1.75; microfiche from NTIS as PB-211 130, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 202 p, 42 fig, 46 tab, 22 ref. EPA Program 12020 DIS 01/72.

Descriptors: *Anaerobic digestion, *Chemical wastes, *Lagoons, Performance, Cost analysis, Sludge disposal, Industrial wastes, Aerobic conditions, Pilot plants, *Waste water treatment, *Orpanic wastes.

Identifiers: *Petrochemical refinery wastes,
*Anaerobic lagoons, *Anaerobic filters, Contact

Bench, semi-pilot, and pilot-scale studies of three anaerobic treatment processes have shown the anaerobic lagoon to be both the performance and economic choice for pretreatment of petrochemical wastes in warm, spacious locations. Se cal wastes in warm, spacious locations. Semi-puot scale studies of anaerobic contact digesters and packed-bed reactors indicated performance problems when treating actual petrochemical wastes. Experimental data from several sources were combined to prepare a design procedure for anaerobic lagoon pretreatment systems. Operation of a large (30 gpm) pilot plant consisting of anaerobic lagoons followed by aerated stabilization and facultative ponds provided a BOD removal from the petrochemical wastes of greater than 90% and a resistance to both organic-loading and pH shocks. Comparison of an anaerobic-aerobic system with a strictly aerobic system pointed out an economic advantage with the series system due to lower sludge-disposal and oxygen requirements. (Lowry-Texas) W72-12010

BIOLOGICAL CONCEPTS FOR DESIGN AND OPERATION OF THE ACTIVATED SLUDGE

Oklahoma State Univ., Stillwater. Bioenvironmental ENGINEERING Labs.

To F. Gaudy, Jr., and T. Gaudy.
Copy available from GPO Sup Doc as EP 2.10:
17090 FQJ 09/71, \$1.25; microfiche from NTIS as PB-211 131, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 154 p, 36 fig, 3 tab, 69 ref. EPA Program 17090 FQJ 09/71.

Descriptors: *Activated sludge, *Design criteria, *Kinetics, Ultimate disposal, Oxidation, Nutrient requirements, Metabolism, Aeration, Mathematic cal models, Biochemical oxygen demand, Sludge disposal, *Waste water treatment, Biological treat-

Identifiers: *Shock loads, *Purification mechanisms, Endogenous phase, Oxidative as-*Purification similation.

Generalized concepts of BOD exertion, the use of COD the measure of biologically available organic matter in a waste sample as a design and opera-tional tool, the stoichiometry and mass balance concepts of treatment, and kinetics equations for microbial growth are presented. Design models are discussed, and a model for completely mixed reac-tors holding recycle solids, XR, constant is recommended. Some guidelines for accommoda various types of shock loadings are included. Con-cepts of oxidative assimilation and the multiple effects of solids concentration, nitrogen concentration, and detention time are related; a new activated sludge process (continuous oxidative as-similation) for nitrogen deficient wastes is presented. Data supporting the concept of total ox-idation are presented, and a modification of the extended aeration process incorporating chemical hydrolysis of portions of sludge is recommended. Some possible flow diagrams for complete aerobic ent (purification and sludge disposal) of metabolizable organic wastes are presented. (Lowry-Texas) W72-12011

ESTIMATING COSTS AND MANPOWER REQUIREMENTS FOR CONVENTIONAL WASTEWATER TREATMENT FACILITIES,

Black and Veatch, Kansas City, Mo. W. L. Patterson, and R. F. Banker. Copy available from GPO Sup Doc EPA 17090 DAN 10/71, \$2.00; microfiche from NTIS as PB-211 132, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1971. 250 p, 78 fig, 20 tab. EPA Program 17090 DAN 10/71. Contract 14-12-462.

Descriptors: *Construction costs, *Operating costs, *Maintenance costs, Cost analysis, Cost

comparisons, Management, "Manpower, Waste water treatment, "Treatment facilities.

Identifiers: "Occupation descriptions, "Process costs. Staffing requirements.

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Data for estimating average construction costs, operation and maintenance costs, and manpower staffing requirements, are presented for conven-tional wastewater treatment plants ranging from I to 100 mgd in capacity, and for stabilization ponds ranging from 0.1 to 10 mgd in capacity. Estimating data are included for 21 separate components of conventional plants and 6 separate components of stabilization ponds. Examples of use of the data are given. Estimated average construction costs and operation and maintenance costs are related graphically to appropriate single parameters for respective plant components. Occupation descriptions for 24 job titles related to wastewater treatment, developed in accordance with standards of the Dictionary of Occupational Titles, are in-cluded. The data presented provide means of estimating costs and staffing requirements for a variety of conventional wastewater treatment facilities on an average basis, but do not supplant the need for detailed study of local conditions or recognition of changing design requirements in preparing estimates for specific application. (Low-ry-Texas) W72-12012

SELF PURIFICATION IN SEWERS, Los Angeles County Sanitation Districts, Calif. For primary bibliographic entry see Field 05G. W72-12047

BIOLOGICALLY-EXTENDED PHYSIOCHEMI-

CAL TREATMENT, Michigan Univ., Ann Arbor. Dept. of Civil En-

W. J. Weber, Jr., R. Bloom, Jr., and L. D.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 12, Hall C, Paper No. 25, June 22, 1972, 9 p, 3 fig, 5 ref.

Descriptors: *Adsorption, *Activated carbon. Descriptors: "Assorption, "Activated caroon, "Biodegradation, "Pilot plants, "Aerobic condi-tions, Anaerobic conditions, Sampling, Dissolved oxygen, Suspended solids, Turbidity, Cost analy-sis, "Waste water treatment.

Pilot plant investigations were conducted on expended bed carbon adsorption columns to deternine whether or not maintaining the bacteria, which attach to the carbon particles, in an aerobic state significantly affects either the organic matter reductions or the extended operating capacities observed as a result of bacterial removal and assimilation of organics from the carbon pores. Feed for the adsorbers was treated by chemical coagula-tion, upflow clarification and dual media filtration. Daily samples were analyzed for TOC, SOC, SS, turbidity, and dissolved oxygen. In examining aerobic versus anaerobic operation, two parallel adsorption systems were operated with a common feed under identical conditions, except that oxygen was introduced to one, maintaining a 6-10 mg/l DO level throughout the system. In explaining the observed phenomena, it was theorized that incomplete anaerobic degradation takes place at the carbon surface and the degradation products, not readily held by the carbon, diffuse outward to be degraded by aerobic bacteria. Treatment costs, based on a carbon exhaustion rate of 250 lbs/million gallons (the rate achieved in the aerated expended-bed pilot plant) for combined physiochemical treatment operation would be less than 19 cents/1000 gallons, with further savings possible in reduced capital costs may be realized through decreased regeneration equipment requirements. (Lowry-Texas) THE CURRENT STATUS OF TECHNOLOGI-CAL DEVELOPMENT IN WATER RECLAMA-

TION, National Inst. for Water Research, Pretoria (South

M. R. Henzen, L. R. J. Van Vuuren, and G. J.

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Preprint, presented at Sixth International Water Pollution Research Conference, Session 12, Hall B, Paper No. 23, June 22, 1972, 12 p, 1 fig, 1 tab, 30 ref.

Descriptors: *Water reuse, *Water purification, *Waste water treatment, *Separation techniques, *Phosphorus, *Nitrogen, Ammonia, Ion exchange, Lime, Chemical precipitation, Activated carbon, Adsorption, Chemical oxygen demand, Chlorination, Filtration, Sludge disposal.

Wastewater represents a potential source of pollution to the wetter climates and a potential source of water to the more arid regions. In converting wastewater from a contaminated state to a state suitable for various purposes, including direct reuse as a potable water supply, numerous techniques have been developed. The major problems to be handled by water purification systems are nitrogen removal, phosphorus removal, organics and inorganics removal and disinfection. Nitrogen removal methods discussed include pH elevation, ammonia stripping, biological denitrification, selective ion exchange, and chlorination of ammonia. Phosphorus can best be removed by excess lime precipitation, while the various heavy metals require individual solutions. Current organics removal schemes discussed include flocculation, adsorption, and biological oxidation, while inorganics removals may be accomplished by ion exchange, reverse osmosis, distillation, and electrodialysis. Pathogenic organism elimination has been accomplished by disinfection by chlorine and other gases, as well as by sand filtration. Sludge honding however remains a diff-Wastewater represents a potential source of polluby chlorine and other gases, as well as by sand fil-tration. Sludge handling, however, remains a dif-ficult problem. (Lowry-Texas) W72-12049

SURVIVAL OF ENTEROVIRUSES DURING ANAEROBIC SLUDGE DIGESTION, National Inst. of Public Health, Budapest (Hunga-

ry). A. Palfi.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 13, Hall A, Paper No. 26, June 22, 1972, 6 p, 4 tab, 10 ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, *Virus, Bacteriophage, Biocontrol, Microbiology, Analytical techniques, Public health, Sampling, *Waste water treatment. Identifiers: *Detention time.

Quantitative virological examinations were carried out on 74 digested sludge samples from anaerobic equipment operating in Budapest, Hungary in 1969. In 1970, after modification of the digestion procedure, 82 further samples were examined for enterovirus density. The effects on virus survival of various conditions of digestion (temperature, detention time) were compared. These comparisons demonstrated that the modifications made to the anaerobic digestion equipment. nameparisons demonstrated that the modifications made to the anaerobic digestion equipment, namely Conger detention time, higher temperature, and addition of an unmixed secondary digester, caused a virus density decrease of 60% in the digested sludge, and compared with the raw sludge an overall reduction of 80% was recorded. Number of viral strains isolated in one sample was also lower, and the number of viruses types also fell from eight to three. As quantitative determinations and the number of viruses types also fell from eight to three. As quantitative determinations show, the virus concentration of the digested sludge is 0.85 virus unit per 100 ml (MPNCU) while that of raw sludge is 1.9 MPNCU, or a 95% reduction. However, it should not be overlooked that digested sludge treated by the modified technology remains a potential source of infection and should be handled as such. (Lowry-Texas) W72-12050 THE VIRUS PROBLEM IN THE WINDHOEK WASTEWATER RECLAMATION PROJECT, National Inst. for Water Research, Pretoria (South

Africa). E. M. Nupen, and G. J. Stander.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 4, Hall C, Paper No. 8, June 20, 1972, p C/4/8/1-C/4/8/10, 2 fig, 1 tab, 26 ref.

Descriptors: *Viruses, *Water reuse, *Disinfec-tion, *Chlorination, *Waste water treatment, Reclaimed water, Surveys, Hydrogen ion concen-tration, Analytical techniques, Epidemiology, Sal-monella, E. Coli.

Identifiers: Free residual chlorine, Virus concentration, Ultrafiltration, Concentration method, Enteroviruses, Reoviruses, Total plate counts.

On routine monitoring no virus was isolated from the final effluent of the Windhoek Wastewater Reclamation Plant. Virus was isolated from the mixed conventionally purified Goreangab Dam and reclaimed waters. Intensive testing of all other sources of water supply to the Windhoek area resulted in the isolation of viruses from natural resulted in the isolation of viruses from natural water supplies and also from conventionally purified Goreangab Dam Water. An ultrafiltration method utilized for virus concentration was described. This method gave an average of 70% recovery of virus and has the advantage of allowing 10 liters or more of clear water or even slightly turbid samples to be processed in a matter of hours. In order to ensure virus inactivation, breakpoint chlorination should be applied to guarantee a free available residual chlorine, subject always to the reservation of a low enough pH to provide the hypochlorous acid concentration. In the Windhoek Wastewater Reclamation Plant break-point chlorination with a resultant free residual chlorine of 0.5 mg/l has been the standard requirement for disinfection. (Galwardi-Texas)

ACTIVATED SLUDGE TREATMENT OF SMALL WASTE VOLUMES, Ecodyne Corp., Lenexa, Kans. Smith and Love-

Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall C, Paper No. 28, June 22, 1972, 12 p, 5 fig, 5 tab, 10 ref.

Descriptors: *Activated sludge, *Design criteria, *Mathematical models, Organic loading, Aeration, Metabolism, Oxidation, Operation costs, Cost analysis, On-site investigations, Sludge disposal, *Waste water treatment, *Sludge treatment. Identifiers: Small waste volumes, Hydraulic loading. Detention time.

Although thousands of small scale (<1.0 mgd) activated sludge plants are currently in operation, highly conservative design constraints have been imposed, first by custom and later by regulation, which seriously limit the capabilities of these plants. Mathematical models for the activated sludge process were derived and tested in 8 full scale plants. Each treatment plant was operated at the specified sludge age and aeration period for a minimum of 30 days. Predicted performance, at a sludge loading rate some 3 times that commonly employed in the U.S. in connection with small acemployed in the U.S. in connection with sinaia ac-tivated sludge systems, was closely approximated by the observed values. Solids accumulation in-creased by only 9% in decreasing the aeration period from 24 to 4 hours, while aeration require-ments decreased by 60%, all at no sacrifice in process efficiency. Since no efficiency loss oc-curred, the favorable economics alone should be reason enough for a thorough review of package plant design criteria. (Lowry-Texas) W72-12052 EFFECT OF BIOLOGICAL CONDITIONING ON REQUIRED POLYMER DOSAGES FOR SLUDGE DEWATERING, Virginia Polytechnic Inst. and State Univ., Blacksburg.

O. M. Kassem

Master's Thesis, March 1972, 53 p, 14 fig, 2 tab, 28

Descriptors: *Municipal wastes, Sludge, *Filtra-tion, *Sludge digestion, *Anaerobic conditions, *Aerobic conditions, Chlorination, Polymers, Analytical techniques, Laboratory tests, Activated sludge, *Waste water treatment.

Identifiers: Specific resistance, Buchner funnel.

The effects of acrobic digestion, heavy chlorination, and anaerobic storage on polymer conditioning requirements for activated sludge were determined using Buchner funnel filtration rates and specific resistances in laboratory scale tests. Waste sludges from two extended aeration units, and an overloaded conventional activated sludge plant were used. All three plants were treating municipal wastes. Two anionic and two cationic polymers were used. The optimum polymer dose for the sludge prior to processing was added to the samples taken from the various processes and compared with samples which had no polymer added. Polymer addition generally prevented the extreme filtration times that occur after long periods of aerobic digestion. When the initial op-The effects of acrobic digestion, heavy chlorinaperiods of aerobic digestion. When the initial op-timum polymer dose is used throughout the digestion period, virtually no improvement in fil-terability can be obtained with aerobic digestion, and a worsening of the filtration rate occurs. Aerobic digestion can produce a considerable decrease in the optimum polymer dose for sludge conditioning. In general, chlorination prior to polymer coning. In general, calorination prior to polymer conditioning is detrimental, however, with a difficult, poorly stabilized sludge, HTH addition of 250 mg/l or less improved filterability. A 750 mg/l dose to the same sludge worsened filterability. Short periods of anaerobiosis (3 hours) are detrimental to polymer conditioning, while periods of a day or more tended to improve polymer conditioning. It was further noted that anaerobiosis produces a shift in optimum polymer dose. (Lowry-Texas) W72-12053

CENTRALIZED SEWAGE TREATMENT AT DINMOW.

Effluent and Water Treatment Journal, Vol 9, No 5, May 1969, p 273-274, 2 fig.

Descriptors: *Municipal wastes, *Waste water treatment, *Treatment facilities, River basin development, Total costs, Settling basins, Trickling filters, Digestion tanks, Anaerobic digestion, Size. Identifiers: *Dunmow (England), Humus tanks.

A new sewage treatment works representing the first stage in the development of the Lower Chelmer Valley sewerage scheme was described. The scheme has provided for centralization of sewage treatment facilities serving a number of drainage areas and includes construction of additional services to exist a cristian extension. tional sewers to relieve existing systems and to ac-comodate new flows from development areas. The comodate new most from overlooment areas. In the new treatment works, serving a population of 4,000, has a capacity of 200,000 gpd and can be expanded to serve a population of 12,000. Main features of the new treatment works were two 30-ft. diameter upflow sedimentation tanks, two 85-ft. diameter bio-filters, and two 30-ft. diameter humus tanks. Total cost of the first stage construc-tion amounted to 291,579 pounds. (Galwardi-Tex-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

REGIONAL WASTEWATER MANAGEMENT SYSTEMS FOR THE CHICAGO METROPOLITAN AREA-SUMMARY REPORT. Office of the Chief of Engineers (Army), Washing-

Department of the Army, Office of the Chief of Engineers, Summary Report, March 1972, 20 p, 4

Descriptors: *Alternate planning, *Water quality control, *Tertiary treatment, Aerated lagoons, Irrigation, Domestic wastes, Performance, Reliability, Storm runoff, Storage, Water reuse, Cost analsis, Waste water treatment, Indiana, Illinois. Ientifiers: *Physical-chemical treat ysis, Waste Identifiers: treatment.

Three wastewater management alternatives and their associated capital and annual costs were as-sembled for the greater Chicago Metropolitan Area. The first alternative involved addition of advanced biological waste treatment to the three largest existing secondary plants. The second alternative investigated was the abandonment of all biological plants in favor of new physical chemical treatment plants. Finally, a scheme of aerated lagoons, sedimentation, and irrigation on agricultural lands was proposed. Systems were designed on two bases: (1) 2376 mgd wastewater flow with 300 mgd of the expected 600 mgd urban runoff; and (2) 2376 mgd wastewater flow with 600 mgd urban runoff and 600 mgd agricultural runoff. The land treatment scheme, at a cost of \$21.80/capita/year for the municipal plus half the urban storm flow and \$47.10/capita/year for the inclusion of both urban and agricultural storm flow, was also shown to be the most reliable scheme because of its inherently large storage volumes. In addition, the elimination of urban area treatment plants, provision of cooling water for power generation, and possible utility in creating greenbelt areas are all potential advantages of the system, leading to its recommendation. (Lowry-Texas) W72-12055

COLOUR REMOVAL FROM BLEACHED

KRAFT-PULP WASTEWATERS,
J. Bebin, P. Boulenger, and J. C. Bourdelot.
Preprint, presented at Sixth International Water
Pollution Research Conference, Session 12, Hall
C, Paper No. 24, June 22, 1972, 8 p, 4 fig. 7 tab, 7

Descriptors: *Pulp and paper industry, *Bleaching wastes, *Chemical precipitation, Color, Chemical oxygen demand, Separation techniques, Hydrogen ion concentration, Lime, Sludge, Centrifugation, Polyelectrolytes, Incineration, Cost analysis, *Waste water treatment.

The aluminum sulphate precipitation process has been developed as a substitute for the lime precipitation process in the treatment of highly colored bleach plant wastes. A laboratory scale study of the process extended over many months on site at a modern bleached kraft pulp mill. The reaction involves pH adjustment to the desired value, close to pH 4.1, and precipitation of an aluminum organic precipitate as well as the excess aluminum ions. After 2 hours of settlement and polyelectrolyte addition, a volume of 0.2 m3 containing 3 kg dry matter/m3 of waste treated is obtained. After thickening, centrifugation and conditioning by anionic polyelectrolyte, the 18 to 23% dry matter sludge is incinerated. The white powder due remaining contains mainly Al2O3 which can be redissolved in sulfuric acid to form aluminum sulphate, with very little insoluble residue minum supplate, with very little insoluble residue remaining. Operation of both precipitation methods on a waste of pH 10.2, 3700 mg/P+/l of colour and 2300 mg/l of COD, 93% colour removals and 77% COD removals were achieved by the aluminum sulphate method as opposed to 88% colour and 69.5% COD removals achieved by the lime method. Costs per ton of pulp in dollars were 2.175 and 2.42 for the aluminum sulphate and lime processes respectively. (Lowry-Texas)

MESOPHILIC DIGESTION OF MOLASSES DISTILLERY WASTEWATER. BEET Central Public Health Engineering Research Inst., Calcutta (India). Zonal Lab. A. K. Basu, and E. Leclerc.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 15, Hall C, Paper No 30, June 23, 1972. 10 p, 8 fig, 5 tab, 12

Descriptors: *Sugar beets, *Sludge digestion, *Organic loading, Distillation, Toxicity, Performance, Hydrogen ion concentration, Alkalinity, Temperature, Methane, Industrial wastes, Laboratory ture, Methane, Industrial tests, *Waste water treatment.

Identifiers: *Distillery waste water, *Molasses, Sludge return, Detention time.

Laboratory scale digestors were operated on beet molasses distillery waste water at 35C. Samples taken after acclimatization were analyzed by polarographic methods for copper, lead, and zine Three methods of operation were used, including batch, conventional, and high-rate digestion. Results showed that: (1) an optimum BOD reduction of 95.9% from an initial 32,013 mg/l to 1299 mg/l, was achieved with a 3.2 kg/m3-day organic loading and a 10 day detention time; (2) retarded digestion occurred at a 3.5 kg/m3-day organic loading at a 10 day detention time; (3) gas production is related to detention, with little bearing on the organic loading rate up to a certain limit; (4) volatile acid concentrations much higher than 2,000 mg/l could be tolerated provided the digester buffering capacity is not lost; (5) sludge return was necessafor successful digestion; and (6) batch digestion was unacceptable owing to the long lag period. Conventional digestion did not merit consideration because of the high efficiency of BOD loading and removal at high rate digestion. (Lowry-Texas) 72-12059

ON THE TREATMENT OF POLYCHLORINATED BIPHENYL IN WATER BY IONIZING RADIATION, Radiation Center of Osaka Prefecture, Osaka

(Japan).

S. Kinoshita, and T. Sunada.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 13, Hall C, Paper No 26, June 22, 1972. 6 p, 1 fig, 5 tab, 7

Descriptors: *Chlorinated hydrocarbon pesticides. **Gamma rays, *Cobalt, Colloids, Coagulation, Sedimentation, Filtration, Chemical wastes, Separation techniques, Activated carbon, Toxicity, *Waste water treatment, *Polychlorinated biphenyls, *Radiation, Ionization.

Colloidal aqueous solutions of Polychlorinated Biphenyl (PCB) at 50 and 100 ppb, were exposed to .01, 0.1, and 10.0 M rad of gamma rays from Cobalt-60 at a rate of 2 x 105 r/hr respectively. The bottles were rotated to maintain as uniform a dose rate as possible. The PCB in aqueous solution was destroyed by ionizing radiation, but its resistance to radiation was far more than other chlorinated hydrocarbons such as pentachlorophenol or DDT and other pesticides such as parathion. Although this may seem to present a difficult problem, proposed radiation treatment generally consists of several procedures such as sedimentation by coagulation, filtration, and postchlorination. Conventional treatment by sedimentation with coagulation was so effective in treating PCB that the proposed radiation treatment would result in thorough removal. Acute toxicity of irradiated PCB solution is found to be far less than the nonirradiated solution for striped shrimps, and the ir-

radiation products show reduced toxicity. (Lowry-Texas) W72-12060

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REASSESSMENT OF THE VIRUS PROBLEM IN SEWAGE AND IN SURFACE AND RENOVATED WATERS, National Environmental Research Center, Cincinnati, Ohio.

G. Berg.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall B, Paper No 28, June 22, 1972. 8 p, 1 fig, 6 tab, 10

Descriptors: *Viruses, *Bacteria, *Disinfection, Separation techniques, Analytical techniques, Polyelectrolytes, Public health, Filtration, Coagu-lation, Water renovation, *Waste water treatment.

Detectable virus levels have been discovered in both sewage and natural waters. Although large numbers of bacteria must usually be present to cause infection, such is not the case for viruses, since even very small amounts may cause infections which generate large amounts of viruses to be passed on to other organisms. Present techniques for determining viral concentrations in both sewage and natural waters include: (1) the two-phase separation technique; (2) the Al (OH)3-protamine sulfate method; and (3) the polyelec-trolyte-silt method. Viral recovery in the laboratory has been erratic with all three methods, suggesting that when viruses are detected, many more are present that are not detected. Virus removals from surface and sewage waters are accomplished in part by activated sludge (providing the best removals of all biological processes but with er-ratic results), rapid filtration following coagula-tion, carbon adsorption and other physical-chemical treatment processes. However, disinfection is still mandatory to ensure a safe effluent. Because of the development of better viral detection techniques and better removal methods, renovated potable water produced directly from sewage may soon be a lesser hazard than the increasingly contaminated natural supply because of the extreme care taken in quality control. (Lowry-Texas) W72-12061

DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE, Engineering-Science, Inc., Oakland, Calif J. Scherig, and H. F. Ludwig.

Third International Water Pollution Research Conference, Munich, Germany, Advances in Water Pollution Research, Vol 3, 1966. p 217-237, 6 fig, 10 tab, 10 ref.

Descriptors: *Analytical techniques, *Sewage sludge, *Flotation, *Seawater, Efficiencies, Laboratory tests, Laboratory equipment, Statisti-cal methods, Skimmings, Soaps, *Waste water treatment.

Identifiers: *Floatable matter, *Hexane extracta-ble matter, Gravity flotation, Vacuum flotation,

A special teflon-coated funnel was developed to measure the flotables content, including those solids which floated only after immersion water, of domestic sewage. The effects of mixing time, flotation time and seawater addition were investigated. The coefficient of variation of the test ranged from 5.7% and 96% recovery for a sewage containing 49 mg/l floatable material, to a coefficient of variation of 20% and 92% recovery for a sewage containing 1.0 mg/l floatable material. Seawater addition resulted in a 0.7 mg/l increase in floatable material in a freshwater sewage containing 1.1 mg/l floatable material. A liquid-extraction method for the determination of hexane-extractable material (HEM) in sewage was developed using direct extraction of a one-liter sample. Extraction of fat and fatty acid standards showed an

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average recovery of 98.5% for samples containing from 6 to 100 mg/l fat. The most reliable extraction results were obtained when samples were acidified and preheated at 72-75C for 1 hour followed by 3 hr. of extraction. Solvent evaporation consisted of evaporation to dryness at room temperature followed by drying for 5 min at 85C. The average concentrations of floatable material in primary effluent were 2.2 plus or minus 1.4 mg/l and 1.5 plus or minus 0.7 mg/l, respectively, for 2 plants employing gravity flotation and 0.6 plus or minus 0.7 mg/l, respectively, for 2 plants employing scauum flotation. The skimmings collected by gravity flotation contained 93-98% HEM, whereas the skimmings collected by yacuum flotation contained only between 33 and vacuum flotation contained only between 33 and 41% HEM. (See W72-12063 and W72-12064) (Galwardi-Texas) W72-12062

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTA-BLES IN SEWAGE'. Los Angeles County, Calif. J. A. Lambie.

matter. Grease.

Third International Water Pollution Research Conference, Munich, Germany, Advances in Water Pollution Research, Vol 3, 1966. p 240-241.

Descriptors: *Analytical techniques, *Sewage sludge, *Temperature, Wind, Currents, Oil, Oceans, Waste water treatment. Identifiers: Floatable matter, Hexane extractable

A satisfactory method of varying stirring and quiescent periods to simulate wave and current action and of bringing the sample to infinite saline dilution to evaluate density and ionic changes in the determination of floatables in sewage was reported by Scherig and Ludwig. However, it was pointed out that temperature should be taken into consideration. Refinements of the tentative wetextraction method for the determination of grease published in Standard Methods for the Examinapublished in Standard Methods for the Examina-tion of Water and Wastewater was presented. With the simple and reliable method which was developed it may be possible to establish criteria for the maximum allowable grease and oil content as a guide in the prevention of a nuisance in the receiving waters. (See also W72-12062) (Galwardi-Texas) Texas) W72-12063

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE,'

California State Water Resources Control Board, Sacramento.
P. R. Bonderson, and G. Gribkoff.

Third International Water Pollution Research Conf., Munich, Germany, Advances in Water Pol-lution Research, Vol 3, 1966. p 237-240, 3 ref.

Descriptors: *Analytical techniques, *Oceans, *Sewage sludge, Currents, Temperature, Winds, Soaps, Hydrolysis, Efficiencies, Laboratory tests, Waste water treatment.

Identifiers: Floatable matter. Hexane extractable

Under laboratory conditions using the method of Scherig and Ludwig, the recovery of particulate floatables in low concentrations increased in denser waters. It was pointed out that different conditions may exist in ocean waters because of currents, temperature and winds, and that these will affect the amount of particulate materials near the surface. The increased efficiency and percentage of recoveries in the determination of hexane-extractables were due to more complete hydrolysis of the soaps. It was recommended that further investigations be conducted in order to correlate particulate floatables and hexane-extractable concentrations in an effluent with physical or visual centrations in an effluent with physical or visual conditions of the receiving waters. A sampling

technique for floatables and hexane-extractables in large bodies of waters such as oceans and lakes should be developed but may prove to be a dif-ficult achievement. (See also W72-12062) (Galwardi-Texas)

A LOW COST OPEN TANK PURE OXYGEN SYSTEM FOR HIGH RATE TOTAL OXIDA-

Metropolitan Denver Sewage Disposal, Colo. D. B. Cohen.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 5, Hall B, Paper No 9, June 20, 1972. p B/5/9/1-B/5/9/10, 2

Descriptors: *Sludge digestion, Oxygen, *Ozone, *Sludge treatment, Activated sludge, Municipal wastes, Pilot plant studies, Cost comparison, Flotation, Efficiencies, Performance, Design data, Bubbles, Size, *Waste water treatment, *Oxidation, *Colorado.

Identifiers: *Diffusers, Open tanks, Aerobic digestion, Solids stabilization, Volatile solids, Thickened sludge, *Denver (Colorado).

Pilot plant studies conducted by the Metropolitan Denver Sewage Disposal District using an open tank pure oxygen system for total oxidation of sludge were described. A high efficiency diffuser developed by Martin Marretta Company, was util-ized because of its ability to create gas bubbles having less than a 0.2 mm diameter. The high gas naving less train a 0.2 mm unameter. The high gas transfer efficiencies led to an investigation of the possibility of increasing the sludge stabilization rate by substituting ozone for part of the oxygen in the gas stream. Results showed that the % volatile solids in the return sludge could be reduced in six hours from 75 to 50% using very small quantities of ozone. Aerobic digestion of waste activated sludge, thickened to 4.5% solids by air flotation, studge, thickened to 4.5% solids by air hotation, resulted in a 61.3% mass reduction during ten days, and represented a doubling of the digestion rate normally maintained with 0.8% return activated sludge. Results from a comparison of pilot plant data using the high efficiency diffuser with average operations parameters for the Metro. Denver system were presented in tabular form. Plant expansion costs based on conventional riant expansion costs based on conventional design parameters were compared with cost estimates for full scale pure oxygen systems using O2/O3 digestion of excess sludge in place of the present method of aerobic digestion. (Galwardi-Texas) W72-12065

THE INTERRELATIONSHIP OF BIOLOGICAL-CARBON ADSORPTION SYSTEMS FOR THE TREATMENT OF REFINERY AND PETROCHEMICAL WASTEWATERS,

PETROCHEMICAL WASTEWATERS, Engineering-Science, Inc./Texas, Austin. D. L. Ford, and M. A. Buercklin. Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall C, Paper No 23, June 22, 1972. 9 p, 5 fig, 1 tab, 9

Descriptors: *Activated sludge, *Activated carbon, *Pilot plants, Adsorption, Industrial wastes, Color, Toxicity, Heavy metals, *Oils, Chemical oxygen demand, Cost analysis, *Waste water

One of the major obstacles involved in both designing carbon contact plants for treatment of refinery waste waters, and estimating costs for refinery waste waters, and estimating costs for such treatment, is the lack of previous full-scale plant experience. Therefore both technical and economic justification must be predicted based on comprehensive pilot plant evaluations. Investigations have indicated that adsorption theory described by rate equations and the distinct breakthrough curve geometry seldom apply to complex industrial waste waters. The presence of

persistent BOD organics leakage, discovered in recent pilot plant tests of total carbon systems, in-dicates that the series biological-carbon system will probably become increasingly prevalent. A more pronounced breakthrough curve and smaller more pronounced breakthrough curve and smaller adsorption zone depth were observed for carbon adsorption removal of TOC and COD when biologically treated effluent was used as column feed as compared to primary (oil separator) ef-fluent feed. Although significant economies of scale exist for both activated sludge and carbon adsorption, cumulative cost curves for series biological carbon surters have indicated listles. biological carbon systems have indicated little in-centive to design for more than 70% or less than 40% COD removal in the activated sludge unit. (Lov ry-Texas) W72-12066

AN ATTEMPT TO TAKE ACCOUNT OF BIOLOGICAL STORAGE IN THE MATHE-MATICAL ANALYSIS OF ACTIVATED SLUDGE BEHAVIOR, J. C. Jacquart, J. M. Rovel, and D. Lefort.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 4, Hall B, Paper No 8, June 20, 1972. p B/4/8/1-B/4/8/6, 3 fig. 5 ref.

Descriptors: *Activated sludge, *Mathematical models, *Organic loading, *Respiration, *Biochemical oxygen demand, Simulation analysis, Time, Bacteria, Storage capacity, *Waste water treatment.

Identifiers: Respiratory activity, Warburg respirometer, Field measurements, Food storage.

Measurements at different activated sludge treatment plants showed that an important aspect of the behavior of activated sludge has not been the behavior of activated sludge has not been covered in mathematical models of the activated sludge process reported in the literature. The delay between the occurrence of peak BOD5 loads and peak respiratory activity has been omitted. Delays of 3 to 4 hours were noted for the respiratory activity behind the organic load. A mathematical model was developed to calculate the respiratory activity taking into account the ability of bacterial cells to store externelly or internally not of the orcells to store externally or internally part of the or-ganic load. A favorable comparison of calculated and observed values of respiratory activity was obtained. Field measurements were conducted over a 36 hour period. A Warburg respirometer was used to measure respiratory activity. (Galwardi-Texas)

RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFIL-TRATION BASINS, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. H. Bouwer, E. D. Escarcega, R. C. Rice, and M. F.

Nggs.
Copy available from GPO Sup Doc EPA 16060
DRV 03/72, \$1.00; microfiche from NTIS as PB211 164, \$0.95. Environmental Protection Agency,
Water Pollution Control Research Series, March
1972. 102 p, 33 fig. 15 tab, 13 ref. EPA Program
16060 DRV 03/72.

Descriptors: "Water reuse, "Tertiary treatment, "Groundwater recharge, Design criteria, "Infiltration, Water spreading, Cost analysis, Water table, Nitrogen, Denitrification, Phosphates, Fluorides, Boron, Coliforms, Waste water treatme

A field project demonstrated the feasibility of A field project demonstrated the feasibility of renovating secondary sewage effluent by ground-water recharge with infiltration basins. Maximum loading rates were obtained with cycles of 20 days flooding rotated with dry periods of 10 days in the summer and 20 days in winter. With these schedules the system could infiltrate 300-400 ft/year using a water depth of 1 ft. Grassed basins had higher infiltration rates, and a gravel covered

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

basin had a lower infiltration rate than a bare soil basin as a lower influration rate than a bare soul basin. Essentially complete removal of BOD and fecal coliform, and significant removal of phosphorus, nitrogen and fluoride were obtained. Hydraulic properties of the aquifer were evaluated by analog from the response of piezometric heads in the groundwater system to infiltration. These properties were then used in the design of a proto-type system, which would yield renovated water at an estimated total cost of about \$5 per acre-foot at the pump. (Lowry-Texas) W72-12071

FULL SCALE RAW WASTE WATER FLOCCU-

LATION WITH POLYMERS, District of Columbia Dept. of Sanitary Engineer-

ing, Washington.
P. V. Freese, and E. Hicks.
Copy available from GPO Sup Doc EPA 17050
EJB 11/70, \$0.60; microfiche from NTIS as PB-211 240, \$0.95; paper copy \$2.60. Environmental Protection Agency, Water Pollution Control Research Series, November 1970. 49 p, 5 fig. 16 tab, 5 ref. EPA Program 17050 EJB 11170.

Descriptors: *Flocculation, *Sedimentation, *Sludge disposal, Suspended solids, Polymers, Filtration, Biochemical oxygen demand, *Waste water treatment, *District of Columbia.

Identifiers: *Elutriation, *Raw waste water floc-

Three polymers, Dow's anionic A-21 modified with cationic C-31, Hercules' cationic Reten 210, and Calgon's anionic ST 269 with a clay builder, were added to the District of Columbia's raw waste water in 240 MGD tests of raw waste water flocculation. The objectives of polymer flocculation of the raw waste water were to increase solid capture in the primary tanks, reduce the BOD load to aeration, and permit recycle of the elutriate to the plant's influent. A-21 increased the amounts of raw and thickener overflow solids captured within the primary basins by 25%. With recycle of the solids in the elutriate, the amount of captured solids increased by 50%, compared to elutriate recycled without polymer treatment. ST 269 did not increase the capture of the raw and thickener overflow solids. Later, with reduced ST 269 dosage and recycled elutriate, the solids captured increased by 40% compared to the elutriate recycle without polymer treatment. Reten 210 increased amounts of the captured solids (by 19%) only when the elutriate solids were recycled. Polymer treatment of raw waste water did not improve the solids capture in elutriation or permit continuous elutriate recycle. (Lowry-Texas)

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS.

Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05B. W72-12074

FLUIDIZED-BED INCINERATION OF SELECTED CARBONACEOUS INDUSTRIAL

Battelle Memorial Inst., Columbus, Ohio. Colum-

Copy available from GPO Sup Doc EPA 12120 Copy available from UPU Sup 100. FYF 03/72, \$1.00; microfiche from NTIS as PB-211 161, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, March Water Pollution Control Research Series, March 1970. 88 p, 4 fig, 33 tab, 155 ref. EPA Program 12120 FYF 03/72.

Descriptors: *Industrial wastes, *Incineration, *Chemical wastes, Flotation, Sludge, Water pollu-tion control, Textiles, Suspended solids, Hydrogen ion concentration, Waste water treat-

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Identifiers: *Carbonaceous wastes, *Fluidizedbed operation.

The feasibility of fluidized-bed incineration for selected carbonaceous industrial wastes was evaluated. The two-phase program consisted of an initial phase in which wastes from the paint, plastics, rubber, and textile industries in Ohio were characterized, and a second phase in which various waste samples were obtained, analyzed, and experimentally incinerated in a 10 inch diameter fluidized-bed system. Results indicate that sludges from solvent recovery operations in the paint industry, sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of synthetic rubber manufacture, and the waste from the viscose process of the textile industry can be incinerated in a fluidized-bed system without the production of noxious or toxic exhaust gases. The program also indicates that incineration of the various wastes signifi-cantly reduces their potential impact on stream pollution. It is recommended that a demonstration plant be constructed and operated at a site close to the source of several types of industrial wastes. (Lowry-Texas) W72-12075

THE EFFICACY OF THE COMPLETE MIX AC-TIVATED SLUDGE PROCESS IN MODULAR

Mississippi State Univ., State College. Water

Resources Research Inst. E. C. McGriff, Jr.

Available from the National Technical Informa-Two Service as PB-211 156, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, July 1972, 115 p, 8 fig., 41 tab, 31 ref., 4 append. OWRR A-055-MISS

Descriptors: *Activated sludge, *Waste water treatment, *Mixing, Organic loading, Retention, Performance, Efficiencies, *Quality control. Identifiers: *Modular system.

The complete mix activated sludge (CMAS) process in modular mode produces an effluent quality equal to that produced by an equivalent CMAS single-reactor system as evaluated during this research. Furthermore, the modular system maintained a lower sludge production but a greater oxygen demand than the control or single-reactor system. The control and study systems demon-strated ability of the CMAS process to produce good treatment efficiency at various organic loadings with a hydraulic retention time of four (4) hours. The practical value of this study is an indication that the capacity of the CMAS process can be modified, without loss of performance efficien-cy, through the use of a modular system. W72-12102

THE EFFECT OF ORGANIC AMENDMENTS FROM GARBAGE GRINDING ON A BIOLOGICAL TREATMENT SYSTEM, Mississippi State Univ., State College. Water Resources Research Inst.

J. L. Mahloch.

Auxilohie from the National Technical Informe.

Available from the National Technical Informa-tion Service as PB-211 149, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Re-port, June 1972, 47 p, 11 fig, 12 tab, 16 ref, append. OWRR A-054-MISS (1).

Descriptors: *Garbage, *Biological treatment, *Waste water treatment, *Activated sludge, *Organic wastes, *Domestic wastes, Sewage, Statisti-cal analysis.

Identifiers: Microbiological analysis.

A comparison was made between two activated sludge treatment systems, one receiving a mixture of garbage grinder waste effluents and settled domestic sewage at different loadings of garbage wastes, and the other receiving only settled domestic sewage. An evaluation of the two systems was made by utilizing process performance factors, which reflect process response and treatment efficiency, and microscopic ex-aminations of the mixed liquor from both systems. Normal procedures for making a comp between the two systems were reinforced by a statistical comparison of the two data sets obtained. The results indicate that the addition of waste effluents from garbage grinders has no detrimental effect on the performance of the activated sludge treatment systems and that the process is capable of adjusting to a wide range of garbage waste loadings W72-12105

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AN ENZYMATIC TECHNIQUE TO DETECT SURPLUS PHOSPHORUS UPTAKE BY ACTIVATED SLUDGE.

Texas Univ., Austin. Environmental Health Engineering Research Lab. E. G. Fruh, W. E. Morgan, H. G. Moore, Jr., R. B. Higgins, and M. L. Shahan.

Presented at Fifth International Water Pollution Research Conference, July-August 1970, p II-2/1-II2/14, 11 fig, 6 tab, 14 ref. EPA Program 17010

Descriptors: *Waste water treatment, *Nutrients, *Phosphorus, *Bioassay, *Activated sludge, Eutrophication, Bacteria, *Enzymes. Identifiers: *Alkaline phosphatase, Phosphorus

An alkaline phosphatase bioassay was evaluated for use in detecting surplus phosphorus uptake by activated sludge cultures. Using batch experiments a general correlation between percent phosphorus in the suspended solids and the degree of alkaline phosphatase activity was observed; however, abnormally high cellular phosphorus was found only during the lag phase of initially phosphorus starved bacteria. Using continuous flow experiments a similar relationship between percent phosphorus and alkaline phosphatase activity was observed in short term, 3 days; however, long term, 5 days to 2 months, experiments did not establish any definite correlation between alkaline phosphatase activity, cellular phosphorus and growth. All of the experiments conducted in-dicate a general relationship existing between alkaline phosphatase activity and cellular phosphorus. High enzymatic activities and low cellular phosphorus are associated with low influent phosphorus concentrations; low enzymatic activities and high cellular phosphorus are as-sociated with intermediate and high influent phosphorus concentrations. However, no quantitative relationship was found during the experiments relating enzymatic activity to cellular phosphorus. These experiments did not indicate a parspuorus. Inese experiments did not indicate a practical, quantitative relationship between al-kaline phosphatase and cellular phosphorus for evaluating surplus uptake of phosphorus by mixed bacterial cultures; i.e., activated sludge. W72-12116

EVALUATION OF PROCESSES AVAILABLE FOR REMOVAL OF PHOSPHORUS FROM WASTEWATER.

L. K. Cecil.

Available from the National Technical Informa-Available from the National Technical Information Service as PB-211 191, \$3.75 in paper copy, \$0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-034, October 1971, 40 p. 39 ref. EPA Program 17010 DRF Contract 14-12-581.

Descriptors: *Sewage treatment, *Phosphates, Biological treatment, Chemical precipitation, Activated sludge, Physical processes, Tertiary treatment, "Waste water treatment, Costs, "Treatment facilities, "Sludge disposal. Identifiers: Sludge production, Lime, Alum, Iron, Aluminate, "Biological-chemical treatment.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

The more important treatment processes for removal of phosphorus compounds from mucipal wastewater are evaluated for practicality, cost, and impact on the quality of the treated effluent. The numerous options for the designer in the selection of treating processes, chemicals to be used, and the point or points of chemical application are discussed. A detailed list of phosphorus removal projects of one consulting engineer is given as an example of phosphorus removal projects under design. A list of full-scale phosphorus removal plants, already in operation or planned, shows the type of treatment selected and the operating results expected. Various methods of ultimate sludge disposal are discussed.

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PURIFICATION OF FLUORINE-CONTAINING INDUSTRIAL WASTE WATERS,
International Minerals and Chemical Corp.

Skokie, III. R. E. Bird.

U.S. Patent No. 3,551,332, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 5, p. 2027, December 29, 1970.

Descriptors: *Patents, *Fluorine, *Industrial wastes, *Waste water treatment, Water treatment, wasters, waste water treatment, Water purification, Pollution abatement, Treatment, Water pollution, Water pollution treatment, Chemical wastes, Separation techniques. Identifiers: *Chemical treatment.

Finely divided calcium carbonate, e.g. limestone, is added to the solution in an amount to produce a pH from 3.0 to about 3.3 and to precipitate calcium fluoride. The calcium fluoride is removed by filtration. The amount of calcium fluoride recipitated may be increased by adding soluble phosphate and/or sulfate to the waste water before adding the limestone. (Sinha-OEIS)

W72-12126

METHOD AND APPARATUS FOR WASTE WATER PURIFICATION,
Kurita Water Industries Ltd., Yokohoma (Japan),

T. Horiguchi, A. Matsuo, and T. Ishika. U.S. Patent No. 3,547,816, 3p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1127, December 15, 1970.

Descriptors: "Patents, "Waste water treatment, Water purification, Oxygen, "Aeration, "Filtration, Separation techniques, Equipment, Treatment, Pollution abatement, Water pollution Water pollution, Water pollution treatment, "Aerobic conditions."

Waste waters are kept in an aerobic condition as they are fed to the filter medium. An upright rotatable shaft, in the filtration tank has the capability to keep the filter medium scraped clean to avoid interruptions during the procedure. A scraper blade cleans the filter bed and the sludge is directed to a hollow portion of the shaft. The hollow portion is coupled to a sludge discharge pipe which extends to the exterior of the tank. (Sinha-OEIS) W72-12130

STAGED OXYGENATION OF BOD-CONTAI-NING WATER, Union Carbide Corp., New York. J. R. McWhirter. U.S. Patent No. 3,547,815, 11 p, 10 fig, 5 tab, 13 ref; Official Gazette of the Unites States Patent Office, Vol. 881, No. 3, p. 1127, December 15, 1970

Descriptors: *Patents, *Biochemical oxygen demand, *Oxygenation, *Lagoons, Tanks, Domestic wastes, Municipal wastes, Pollution abatement, Treatment, Equipment, Separation techniques, *Waste water treatment, Water pollution, Water pollution treatment.

BOD-containing water and an active biomass and a feed gas of at least 50% by volume of oxygen are mixed. These form an oxygenated liquid-solid and an unconsumed oxygen-containing gas which is at least 35% oxygen. The latter gas is discharged from the first stage and recirculated against the other fluids with liquid-solid. The gas remaining after this second stage may be discharged to the atmosphere. The waste liquor storage enclosure may be a fabricated tank or a lagoon. Waste liquor enters through a conduit. At least two separate oxygenation chambers float in the lagoon. The liquor is stirred by a mechanical agitator or propeller. (Sinha-OEIS)

BIOCHEMICAL OXIDATION WITH LOW SLUDGE RECYCLE, Union Carbide Corp. New York. E. K. Robinson, and J. R. McWhirter. U.S. Patent No. 3,547,813, 8 p, 6 fig, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1126, December 15, 1970.

Descriptors: *Patents, Sewage treatment, Municipal wastes, Waste water, *Waste water treatment, *Oxygenation, *Biological treatment, *Biochemical oxygen demand, *Aeration, Sludge Identifiers: *Biochemical treatment.

BOD-containing waste water, sludge having 12,000 to 50,000 parts per million total suspended solids content and feed gas (50% by volume oxygen) are mixed in an oxygenation zone to provide mixed liquor of 4000 to 12,000 parts per million total suspended solids content. The gas above the mixed liquor has an oxygen partial pressure of at least 300 millimeters Hg, for a residence time of 20 to 180 minutes to form oxygenated liquor having icasi 500 minimeters Hg, for a residence time of 20 to 180 minutes to form oxygenated liquor having DO content of at least 3 parts per million. The sludge and clarified effluent are separated and part of the sludge recycled to the oxygenation zone. (Sinha-OEIS)

HIGH OXYGEN UTILIZATION IN BOD-CO-NTAINING WATER TREATMENT, Union Carbide Corp., New York. (assignee).

U.S. Patent No. 3,547,812, 7 p, 11 fig, 2 tab, 16 ref, Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1126, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, *Pulp wastes, *Oxygenation, *Aeration, Water treatment, *Waste water treatment, Municipal wastes, Chemical wastes, Industrial wastes, Water pollution, Water pollution treatment, Pollution abatement. Identifiers: *Petrochemical wastes, *Fermentation

BOD-containing water, biomass and feed gas (60% by volume oxygen) are mixed in an aeration zone to form liquor. The mixing continues while maintaining the oxygen feed gas to mixing plus gas-liquor contact energy ratio at 0.03-0.04 lb moles oxygen per horsepower hour of energy supplied. At the same time the aeration gas above the liquor is held at oxygen partial pressure of at least 300 millimeters Hg but below 80% oxygen while consuming at least 50% of the feed gas oxygen in the liquor. The dissolved concentration of the liquor is held below 70% of saturation with oxygen but above about 2 parts per million. Meanwhile there is recirculation of one of the aeration gas and liquor fluids in contact with the other fluids in the aeration zone. Finally oxygenated liquor is aeration zone. Finally oxygenated liquor is withdrawn from the aeration zone. (Sinha-OEIS)

CYCLIC OXYGENATION OF BOD-CONTAI-NING WATER, Union Carbide Corp., New York, (Assignee). J. R. McWhirter.

U.S. Patent No. 3,547,811, 8 p, 6 fig, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol. 811, No. 3, p. 1126, December 15, 1970.

Descriptors: "Patents, "Biochemical oxygen de-mand, Waste treatment, Municipal wastes, Indus-trial wastes, Sewage treatment, Chemical wastes, "Oxygenation, Pollution abatement, Water pollu-tion, Water pollution treatment, Treatment, Treat-ment facilities, "Biological treatment, "Oxygen.

A method and apparatus are provided for the treat-ment of BOD-containing water by cyclic biochemical oxygenation in contact with biomass. The invention effectively utilizes the relative com-ponent equilibrium solubilities and stoichiometry to create a highly efficient system characterized by high percentage oxygen absorption while main-taining a high oxygen partial pressure in the aerat-ing gas system. (Sinha-OEIS)

OZONATION OF INDUSTRIAL WASTE

WATER, Gerber Products Co., Fremont, Mich. M. R. Dietz, and C. R. Moller, Jr. U.S. Patent No. 3,546,114, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 705, December 8, 1970.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Ozone, Pollution abatement, Water pollution, Water pollution treatment, Water treatment, Treatment, Water quality, *Alkaline

A method is presented for treating hot alkaline industrial waste water with ozone to make the water suitable for subsequent reuse. After filtering, ozone in concentrations of about 15 parts per milion is introduced into the water which is at a temperature higher than 160 degrees F. (Sinha-OEIS) W72-12136

METHOD FOR PURIFYING FRESH AND WASTE WATERS BY FLOCCULATION IN AN AMPHOTERIC PHASE,

U.S. Patent No. 3,546,113, 4 p, 7 tab, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 705, December 8, 1970.

Descriptors: *Patents, *Hydrogen-ion concentra-tion, Water purification, Water treatment, *Waste water treatment, *Flocculation, Water pollution, Water pollution treatment, Pollution abatement, *Chemical reactions.

Identifiers: Zinc chloride, Metal salts, Boric acid, Zinc salts, Buffering.

A method is described for the purification of waste waters by flocculation in an amphoteric medium with the use of a water-soluble zinc salt, e.g. zinc chloride, in an environment whose pH is adjusted within the range 7.8-8.5 by employing a buffering solution of alkali metal salts of boric acid. Sodium tetraborate and sodium metaborate are preferred. The preliminary pH adjustment can be made with a strong alkali, this is the case with slightly acidic waters. (Sinha-OEIS) W72-12137

WASTE WATER TREATMENT PLANT,

Passavant-Werke (Germany).

E. R. Thorn.

U. S. Patent No. 3,545,620, 5 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 881, No 2, p 594, December 8, 1970.

Descriptors: "Patents, "Waste water treatment, "Treatment facilities, Pollution abatement, Water pollution, Water pollution treatment, "Floccula-tion, "Sedimentation.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

The waste water treatment plant consists of a central mixing chamber surrounded by a flocculation reaction chamber. Both chambers are located in a rectangular sedimentation basin. A chain scraper may be placed on the bottom of the basin to move settled sludge to a sump. An adjustable scum remover is provided above the sedimentation zone. (Sinha-OEIS) W72-12139

WATER TREATMENT PLANT, Neptune Microfloc, Inc., Corvallis, Oreg. For primary bibliographic entry see Field 05F. W72-12140

PROCESS AND APPARATUS FOR SEPARAT-ING LIQUIDS AND SOLIDS,
American Machine and Foundry Co., New York.

P. Karter. U. S. Patent No. 3,543,933, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 1, p 177, December 1, 1970.

Descriptors: *Patents, Separation techniques, Pol-lution abatement, Gravity, *Filtration, Sedimenta-tion, *Flocculation, *Waste water treatment, *Liquid wastes, Solid wastes, Sewage treatment.

An aqueous sludge is introduced into a collection zone, then the material is passed through a filtering zone. The solids are retained as water passes through. The process is carried out at ambient conditions of pressure and temperature, the separa-tion depending only on gravity. (Sinha-OEIS) W72-12141

APPARATUS FOR THE PURIFICATION OF POLLUTED WATER,

Societe Nouvelle Seta S.A. (France) (assignee). J. M. Boris.

U. S. Patent No. 3,540,589, 3 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 887, November 17, 1970.

Descriptors: *Patents, *Air, Water pollution, Water pollution treatment, Pollution abatement, Equipment, *Bacteria, *Aerobic bacteria, *Aerobic treatment, *Bubbles, *Waste water treatment, Liquid wastes, Treatment, Water treatment.

The apparatus consists of a horizontal tank filled with water to be treated and in which a cylindrical drum rotates. Water is introduced into the tank from which it is evacuated after treatment. Bacteria which are attached to the packing elements of the rotating drum are brought into contact with air and with water. Some water flows inside the packing elements. Some air is also entrapped in the packing element and the air eventually rises to surface of the water as bubbles. (Sinha-OEIS) W72-12142

WATER TREATMENT, Combustion Engineering, Inc., New York. For primary bibliographic entry see Field 05F. W72-12143

REVERSE OSMOSIS WATER PURIFICATION

UNIT, For primary bibliographic entry see Field 03A. W72-12146

METHOD AND APPARATUS FOR NEUTRALIZ-ING ACID WASTE WATER, United States Steel Corp., Pittsburgh, Pa.

A. A. Spinola. U. S. Patent No. 3,541,008, 2 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 984, November 17, 1970. Descriptors: *Patents, *Waste water treatment, *Acidic water, *Acids, Air, Bubbles, pH, Pollution abatement, Acidity, *Neutralization, Treatment, Water treatment, *Aeration, *Oxidation.

An apparatus is provided for neutralizing acid waste water. It comprises a reaction chamber with waste water. It comprises a reaction caramber with a porous plate spaced above the botton, defining an air plenum. Air under pressure is supplied to the plenum and a neutralizer-inlet pipe. Solids removed from the effluent gas leaving a cement kiln are introduced into the air flowing through the neutralizer and are entrained therewith. The input of neutralizer is controlled according to the pH of the treated water which overflows from the chamber into a settling tank. (Sinha-OEIS)

WASTE TREATMENT APPARATUS, Tesco Chemicals, Inc., Atlanta, Ga.
T. E. Schneider, Jr., and W. E. Bradley, Jr.
U. S. Patent No. 3,540,590, 4 p, 6 fig. 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 888, November 17, 1970.

Descriptors: *Patents, *Waste treatment, Equipment, Pollution abatement, Ships, Sea water, Water pollution, Water pollution treatment.

A solid form of soluble chemical compound is eroded or dissipated by the flow of purging liquid toward the waste receptacle. The method includes flowing liquid into the upper portion of a waste receptacle, washing the waste in a downward direction within the receptacle, grinding the waste into small particles, and discharging the waste and the liquid. (Sinha-OEIS) W72-12149

WASTE TREATMENT PROCESS, Energy Systems, Inc., Melbourne, Fla. D. D. Woodbridge, T. A. Nevin, and W. R. Garrett.

U. S. Patent No. 3,539,507, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 593, November 10, 1970.

Descriptors: *Patents, *Waste treatment, *Liquid Descriptors: "ratents, "vaste treatment, "Liquid wastes, Biological treatment, "Filtration, Waste disposal, "Sewage treatment, "Yeasts, "Bacteria, "Gamma radiation, "Waste water treatment. Identifiers: "Sterilization.

Wastes are fed into a wet well or mixing container and pumped into biochemical treatment vats. These may be charged with a specific culture of yeasts. The treated wastes pass into a second set of biochemical vats for the same or modification of the same treatment. The liquid leaving the second vats may be filtered prior to enter junction box where a portion is fed back to the mixing container to keep the waste stirred up. A portion of the liquid after filtration, is fed from the junction box through a sterilizer such as gamma radiation for killing harmful bacteria or other microorganisms. The liquid is filtered again and discharged as needed. (Sinha-OEIS) W72-12150

PROCESS FOR DESTROYING AMMONIA CONTAINED IN WATERS RESULTING FROM THE OPERATION OF COKE OVENS, H. Siewers, K. Flasche, A. Stetter, and S. Pfeiff. U. S. Patent No. 3,540,189, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 789, November 17, 1970.

Descriptors: *Patents, *Coal, *Ammonia, Industrial wastes, Waste treatment, *Waste water treatment, Pollution abatement, Separation techniques, Water pollution, Water quality control, Equip-

A process is presented for removing ammonia from coke oven gas where it is formed during the degasification of coal. The water to be treated is degastication of coal. The water to be treated is heated at an elevated temperature to at least 60 degrees C conveying the lean gas charged with ammonia to regenerators of industrial furnaces, and heating it so that ammonia is dissociated to nitrogen and hydrogen. Details are given of a representative example. (Sinha-OEIS) representat W72-12151

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EVAPORATION-CONDENSATION RECOVERY OF FRESH WATER USING GAS-TRAVERS-ABLE POROUS BED,

For primary bibliographic entry see Field 03A. W72-12153

PROCESS AND INSTALLATION FOR CLARIFI-CATION OF WATER, Compagnie des Eaux et de l'Ozone (France). (as-

signee). J. Guillerd, and C. Valin.

U. S. Patent No. 3,534,855, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 879, No. 3, p. 789, October 20, 1970.

Descriptors: *Patents, Water purification, *Filtra-tion, *Waste water treatment, Pollution abate-ment, Equipment, Treatment, Separation techniques, Water pollution treatment, Water pol-lution, Granules, *Sands.

The filters comprise a series of beds of grant (sand) increasing in size from the top to the bot-tom. The waste water to be cleansed is passed uptom. The waste water to be cleansed is passed up-ward through the filter at a velocity less than that at which the particles would be carried upward by the water. When the filter becomes clogged, a water reserve above it is caused to flow downward to clean the filter. (Sinha-OEIS) W72-12159

REVERSE OSMOSIS CONCENTRATION OF DILUTE PULP AND PAPER EFFLUENTS, Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems; and Pulp Manufactures Research League, Appleton,

Wis. A. J. Wiley, G. A. Dubey, and I. K. Bansal. Copy available from GPO Sup Doc as EPA 12040 EEL 02/72 for \$2.75; microfiche from NTIS as PB-211 184, 30.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1972. 358 p, 68 fig, 105 tab, 29 ref, append. EPA Program 12040 EEL 02/72.

Descriptors: *Reverse osmosis, *Pulp wastes, *Waste water treatment, Water reuse, Economic feasibility, *Membrane processes, Industrial wastes, *Semipermeable membranes, *Desalination, Separation techniques, Water costs.

Identifiers: Chemical recovery, Membrane fouling, Membrane cleaning, Technical feasibility.

Adaptation of reverse osmosis (RO) as a method Auaptation of reverse osmosis (RO) as a mention of concentration for dilute effluents of pulping, bleaching, and paper manufacture was conducted in laboratory, pilot scale, and in large 50,000 gallon per day field demonstrations at pulp mills. Most of these dilute wastes at 1 percent solids contained suspended particles, colloidal suspensoids, large molecular-weight wood derived organics, and/or scale-forming inorganic chemical residues. Tubular membrane systems capable of being operate at self-cleaning velocities increasing beyond 2.0 feet per second, as concentration advanced to 10 percent solids, were apparently best adapted to processing these effluents at sustained high flux rates and relatively free of fouling problems. Capillary fiber and spiral wound sheet membrane systems required expensive clarification treatment systems required expensive characteristic treatment before and during concentration. Tubular systems studied were subject to excessive failure rates in terms of life of membrane support structures or to

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

leakage of internal connections based on the sup-port structure. Feasibility of employing RO for concentration of dilute pulping and bleaching ef-fluents depends on developing routes to substan-tial improvement in life expectancy of RO equip-ment to maintain high flux rates and rejections at much lower membrane maintenance and replace-ment costs than prevailed with equipment availa-ble for these studies conducted from 1967 through 1971. W72-12189

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HIGH RATE FILTRATION OF COMBINED SEWER OVERFLOWS, Hydrotechnic Corp., New York. R. Nebolsine, P. J. Harvey, and Chi-Yuan Fan. Copy available from GPO Sup Doc for \$2.50; microfiche from NTIS as PB-211 144, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 339 p, 27 fig, 31 tab, 27 ref., 5 append. EPA Program No 11023 EY104/72, Contract No 14-12-858.

Descriptors: *Overflow, *Filtration, Anthracite, Sand, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Coliforms, Precipitation, Urban runoff, Activated sludge, Cost estimates, *Ohio, *Combined sewers.

Identifiers: *Cleveland, *Deep bed, Dual media, *Drum screens.

Pilot plant studies were conducted at Cleveland's Southerly Wastewater Treatment Plant in 1970 and 1971, to develop and demonstrate the capabilities of the deep bed, dual media, high rate filtrate treat-ment process for storm caused combined sewer overflows. The treatment system is comprised of a overnows. The treatment system is comprised or a drum screen with a 40 mesh screening element (420 microns opening) followed by a deep bed, dual media, high rate filter of five feet of No. 3 anthracite (effective size 4 mm) over three feet of No. 612 Sand (effective size 2 mm). The results show suspended solids removals of 93 percent, with polyelectrolyte addition, at a filtration rate of 24 gpm/sq ft at an average influent suspended solids of 411 mg/l. Reductions in biochemical oxsolids of 411 mg/l. Reductions in biochemical oxygen demand averaged 65 percent. Capital costs (ENR=1470) for a high rate filtration plant are about \$23,000 per mgd. Total annual treatment costs, including capital and operating charges, range from approx. \$90,000 per yr for a 25 MGD plant to approx. \$390,000 for a 200 MGD treatment facility. Principal advantages of the proposed system are: high treatment efficiencies, automated operation, and limited space requirements as compared with alternate flotation or sedimentation systems. systems. W72-12191

THE URBAN WATER SYSTEM-ECONOMIC ASPECTS, Water Resources Engineers, Inc., Walnut Creek,

Calif.

For primary bibliographic entry see Field 06A. W72-12223

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICATIONS TO PROCESS ANALYSIS AND CON-

Pennsylvania State Univ., University Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 06A.

W72-12237

PACKAGED PLANT HAS NOVEL SCUM REMOVAL SYSTEM.

Effluent and Water Treatment Journal, p 507-510, September 1969. 3 fig, 1 tab, 11 ref.

Descriptors: "Treatment facilities, "Activated sludge, "Settling basins, "Design, Aeration, Scum, Skimming, Biochemical oxygen demand, Efficiencies, Performance, Variability. Identifiers: Package plant, Biox, Extended aeration, Operating data, Pebble bed clarifier.

A versatile packaged sewage treatment plant, Biox developed by Macleod and Miller Ltd. was described. The units consisted of two aeration sections and a central settling section. The unit can be operated as an extended aeration system, a sludge re-aeration system or a split aeration system simply by altering the entry gates which channel the flow as required. Problems associated with other systems were overcome in the Biox by havethe flow as required entry gates which channel the flow as required. Problems associated with other systems were overcome in the Biox by having a central settling section in which mixed liquor enters part-way down through a full-width outlet. The compressor system consisted of three units which allowed considerable flexibility of operation. Supernatant liquor from the settlement chamber overflows a castellated weir to a pebble-bed clarifier prior to discharge. An unusual feature of the plant was the variable-speed scum-removal device which consisted of a turbine paddle wheel powered by a D. C. motor controlled by a speed regulator. Thus, by turning a dial, scum can be removed at any given rate. Operating data were arranged in tabular form and showed an average BOD reduction of 98.5 percent. (Galwardi-Texas) W72-12274

INITIAL DEPTH AS A VARIABLE IN ACTIVATED SLUDGE SETTLING TESTS, North Carolina Univ., Chapel Hill. Dept. of Environmental Science and Engineering. P. A. Vesilind, and R. I. Dick. Effluent and Water Treatment Journal, p 263-267, May 1969. 6 fig, 1 tab, 9 ref.

Descriptors: "Activated sludge, "Settling velocity, "Depth, "Sludge, Laboratory tests, Laboratory equipment, Prototype tests, Scaling, Identifiers: Retardation factor, Batch thickening tests, Initial depth, Thickening, Diameter, Sludge type, Concentration of solids, Cylinder diameter, Stirring rate.

The influence of initial depth of sludge on the settling velocity of sludge in batch thickening tests was investigated. This influence was quantitatively measured in terms of the retardation factor, R, which was defined as the D/V intercept on a D/V versus D plot where D was the initial depth and V the interface velocity. As the settleability of a sludge improved, R decreased and conversely, R was high for bulking sludges. The value of R also depended upon the concentration of activated sludge, being very small for dilute suspensions and increased logarithmically with concentration. Four cylinders, ranging in diameter from 3.5 in. to 36 in. were used to determine the influence of diameter on R, and R was found to increase with cylinder diameter. However, it was suggested that for some on R, and R was found to increase with cylinder diameter. However, it was suggested that for some large enough diameter, R would no longer increase with diameter. The value of R was not influenced by slow stirring. Prototype thickeners have been found to be overdesigned and the failure to consider the initial depth effect in laboratory studies may be one of the major reasons. (Galwardi-Tex-W72-12275

RECLAMATION AND RE-USE OF WATER FROM EFFLUENTS AND SEWAGE, Water Pollution Research Lab., Stevenage (En-G. E. Eden.

Water Pollution Research Laboratory Reprint No. 582, from The Paper Maker, October 1969. 5 p, 3 tab, 15 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Sands, Filters, Reverse osmosis, Electrodialysis, Ion exchange, Ozone, *Water reuse. Microstraining.

Microstraining.

Approximately 2,400 million gallons of sewage is produced in the British Isles each day. Most of this is treated to a quality of 30:20 and discharged to the receiving waters. Effluents of this quality can be used by industry without further treatment for some industrial purposes. Other uses require further treatment. Polishing by filtration, straining, lagooning, or grass plot irrigation is available. Some plants are currently pumping polished effluents to other areas which need additional water. Chemical coagulation, a standard water works technique, can improve the quality of effluents. Advanced treatment processes, electrodialysis, ion exchange resins and reverse osmosis are currently the subject of extensive study in the U. S. The so-called MD process involving microstraining, ozonation and rapid sand filtration has been the subject of extensive pilot plant trials in England. These all offer great promise for the future in the treatment of sewage effluents. It should be possible, by the use of these processes to alleviate many cases of water shortage by supplying high quality effluents to industry. (Goessling-Texas)

R AND D IN WASTE WATER TREATMENT, Water Pollution Research Lab., Stevenage (En-

gland). S. Jackson. Water Pollution Research Laboratory Reprint No. 583, from Process Biochemistry, Vol 5, January 1970. 4 p, 2 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Trickling filters, *Protozoa, *Tertiary treatment, Sands, Plastic, Activated sludge, Lagoons. Identifiers: *Multi-stage filters, *Sludge conditioning. Microstrainers.

ing, Microstrainers.

Comparisons of filters of various dimensions, multi-stage filter, protozoa in activated sludge, sludge conditioning substances, and various methods of polishing sewage effluents were investigated. Laboratory experiments have shown that filters of the same volume using plastic media have essentially the same efficiency regardless of dimensions. A four stage biological filter using plastic media was tested at flow rates of 70 gal/hr for 14 days. Waste water from a pharmaceutical plant provided the influent. The plant produced an effluent of the required quality. Laboratory scale experiments using a septic activated sludge plant have clearly demonstrated the utility of ciliated protozoa in improving the quality of the effluent. A wide variety of substances have been investigated as sludge conditioners. Results to data have been inconclusive due to the large number of variables involved. Sewage effluent standards stricter than 30:20 may require a polishing stage. Grassland irrigation, lagoons, gravity, or upflow sand filters, microstrainers and gravel bed clarifiers have been investigated in collaboration with local authorities and plant manufacturers. Results are reported in tabular form and all can produce effluent of 10:10. (Goessling-Texas)

EVALUATION OF BEEF CATTLE FEEDLOT WASTE MANAGEMENT ALTERNATIVES, Oklahoma Agricultural Experiment Station, Still-

water.
A. F. Butchbaker, J. E. Garton, G. W. A.
Mahoney, and M. D. Paine.
Copy available from GPO Sup Doc EP 2.10:13040
FXG 11/71, S2.50; microfiche from NTIS as PB211 242, \$0.95. Environmental Protection Agency,

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Water Pollution Control Research Series, November 1971. 322 p, 61 fig, 51 tab, 94 ref. EPA Program 13040 FXG 11/71.

Descriptors: *Farm wastes, *Feedlots, *Manag ment, *Agricultural runoff, Ultimate disposal, Cost analysis, Water pollution control, Cattle, Operation and maintenance, Separation techniques, Oxidation lagoons, Transportation, *Waste water treatment, *Waste treatment. Identifiers: *Feedlot waste management alternations.

Alternative beef waste management systems were examined to determine minimum cost systems for effective waste disposal. Design and cost informa-tion was obtained from feedlot visits and the literature. A computer program was developed for use with a Conversational Programming System (CPS) for calculating the sizes of equipment and facilities and for estimating the facility and machinery operating and investment costs. For open feedlots, two waste management systems, solid and runoff-carried, were considered. The total system investment cost for a 20,000 head unpaved feedlot with pollution control was approximately \$420,000 with an operating cost of \$0.133 per animal day (not in-cluding feed mill and storage, office or land costs). The pen facilities were about 65% of the total investment cost, the runoff control system about 10% and the solids handling about 25%. Confinement buildings with slotted floors using slurry handling methods or with solid floors using solid handling methods or with solid floors using solid handling methods of which solid floors using solid floors usi dling methods offer a high potential for completely controlling the animal waste and abating pollution.

A promising system for near optimum pollution control is a cable scraper system underneath a slotted floor for daily removal and disposal of the A manure irrigation system costs about one-half as much as mechanically conveying the slurry to the fields. In semi-arid areas, evaporation lagoons offer another ultimate disposal alternative. (Lowry-Texas) W72-12278

COMPUTERIZED DESIGN AND COST ESTI-MATION FOR MULTIPLE-HEARTH SLUDGE INCINERATORS,

INCINERALORS, Rocketdyne, Canoga Park, Calif. W. Unterberg, G. R. Schneider, and R. Sherwood. Copy available from GPO Sup Doc EP2.10:17070 EBP 07/71. Environmental Protection Agency Water Pollution Control Research Series, July 1971. 166 p, 18 fig, 26 tab, 35 ref. EPA Program 17070 EBP 07/71.

Descriptors: *Computer programs, *Cost analysis, *Incineration, Design criteria, Sludge, Digital computers, Mathematical models, Heat balance, Sludge treatment, *Waste water treatment.

A digital computer program was developed for the preliminary design and cost estimation of an op-timum multiple-hearth-furnace system for sewage sludge incineration. The program was primarily based on field data from nine operating plants, each having one to four furnaces. The individual each naving one to four furnaces. Ine mouvious furnaces covered a range in capacity from 200 to 4500 lb dry solids per hours, in number of hearths from 5 to 11, in outer diameter from 6 to 22 feet, and in hearth area from 85 to 2327 square feet. Operating schedules and thermal cy-ling were considered, the field data were correlated by leastsquare curve fits, and costs were normalized to 1969 dollars. The computer program provides the number, dimensions and ratings of components; expenditures of labor, fuel and power; and all the cost elements for an incineration system which is to process a given flow of sludge having specified characteristics. Cost breakdowns are calculated for capital, total cost per annum and total cost per ton dry solids incinerated. The computer program may also be used for the thermal analysis fuel requirements, heat balance, and mass balance) of a multiple-hearth furnace incinerator witnout design and cost features. (Lowry-Texas)

HYPOCHLORITE GENERATOR FOR TREAT-MENT OF COMBINED SEWER OVERFLOWS.

Copy available from GPO Sup Doc EP2.10:11023 DAA 03/72, \$1.00; microfiche from NTIS as PB-211 243, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1972, 89 p, 31 fig. 11 tab, 6 ref. EPA Program 11023 DAA 03/72. Contract 14-12-490.

*Chlorination, *Storm runoff. scriptors: Water quality control, Electrochemistry, Design criteria, Combined sewers, Disinfection, Computer models, Brines, Chlorine, *Waste water Identifiers: *Electrolytic hypochlorite generator.

An advanced electrolytic generator has been developed for on-site production of sodium hypochlorite for disinfection of overflows from combined sewer systems. In this system an electrochemical cell electrolyzes sodium chlorida in the state of the state brine to chlorine gas and sodium hydroxide solu-tion, which are reacted immediately outside the cell to produce a 5 to 10% sodium hypochlorite solution. Significant advances in safety and economy have been realized by use of a hydraulically impermeable cation exchange membrane. The most critical components, the dimensionally stable anode and the ion-exchange membrane, have both operated for over 3000 hours with no deterioration performance. System operation has been given a first order economic optimization. At a current density of 240 ASF, the cell potential is 3.7 volts. The generator requires 1.6 KWH of electricity and 2.1 pounds of salt per pound of sodium hypochlorite. Salt utilization is over 80%. The operating cost for systems larger than 500 pounds of hypochlorite per day is projected to be 3 to 4 cents per pound of hypochlorite. This cost is significantly below that of truck delivered solution. Such economy of operation should make the generator useful for a wide variety of water treatment applications. The first field unit is scheduled for installation in the Northeast Sanitary District Somerville, Massachusetts, under Grant 11023 DME. The estimated operating and maintenance cost is estimated to be 3.7 cents per pound of chlorine or 0.13 cents per thousand gallons of overflow (Lowry-Texas) W72-12280

FILTRATION OF MUNICIPAL WASTE WITH A

MOVING BED CONTACTOR,
Research Triangle Inst., Durham, N.C. Environmental Studies Center.

F. O. Mixon.

Copy available from GPO Sup Doc EP2.10:17030

FWH 01/72, \$0.60; microfiche from NTIS as PB
FWH 01/72, \$ 211 244, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, January 1972. 51 p, 8 fig, 6 tab, 9 ref. EPA Program 17030 FWH 01/72.

Descriptors: *Filtration, *Suspended solids, *Separation techniques, Porous media, Screens, *Municipal wastes, Trickling filters, Coagulation, Performance, Cost analysis, *Waste water treat-

Identifiers: *Continuous filtration, *Moving bed

A novel moving bed contactor has been utilized in filtration studies of municipal waste at various stages within a trickling filter plant. Granular, buoyant filter medium is slurried with process feed and introduced to the bottom of a column equipped with lateral retaining screens and filter medium harvesting machinery, both positioned toward the top of the column. Within the column, both positioned filter medium rises by buoyancy and forms a porous plug that traps suspended solids from the feed stream. Filtered liquid is removed from the lateral screen, and soiled filter medium is continu-ously removed from the column top, washed, and recycled to the column bottom. The process operates stably and dependably on all feeds testedraw waste water, primary clarifier effluent, and trickling filter effluent. Suspended solids removals of 60 to 80 percent can be achieved at column loadings up to 7.5 gal/min/sq. ft. Filtration of alum-coagulated feed is less effective than that of untreated feed. Costs of the process, including equipment, accurate coestatements. ment, power, construction, and amortization, were estimated at 2.8 cents/1000 gal for a 1 MGD plant and 1.6 cents/1000 gal for a 5 MGD plant, as opposed to 1.2 cents/1000 and 1.1 cents/1000 gal for a 1 mg 5 MGD plant, as for a 1 and 5 MGD microstraining plant, respectively, with microstraining being the closest economic competitor to the moving bed contactor. (Lowry-Texas) W72-12281 This pract anac dicti

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WATER POLLUTION REDUCTION THROUGH RECOVERY OF DESIZING WASTES. North Carolina State Univ., Raleigh. Dept. of Textile Chemistry.

available from GPO Sup Doc EP2.10:12060 EOE 01/72, \$0.60; microfiche from NTIS as PB-211 245, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, Janu 1972. 48 p, 9 fig, 10 tab, 23 ref. EPA Program 12090 EOE 01/72.

Descriptors: *Textiles, *I precipitation, *Industrial Performance Chemical Biodegradation, Acclimatization, Activated sludge, Laboratory tests, Water pollution control, *Waste water treatment, *Water reuse. Identifiers: *Chemicals recovery and reuse, *Carboxymethyl cellulose, *Polyvinyl alcohol, Alum.

Processes for precipitating from desizing wastes the synthetic warp sizes, carboxymethyl cellulose (CMC) and polyvinyl alcohol (PVA), were investigated. Carboxymethyl cellulose is vesugated. Carboxymethyl cellulose is precipitated quantitatively by certain multivalent metal salts. such as alternatively metal salts, such as aluminum sulfate and ferric chloride. Aluminum sulfate is the more suitable for size recovery. Cycles of sizing, desizing and size recovery were performed on cottonpolyester (65:35) yarns, starting with commercial CMC, and continuing with only the recovered material. After four cycles, the performance of the recovered CMC on a Callaway slasher was satisfactory and results with the sized varns on a warp-shed tester were equivalent to results with yarns sized with new CMC. Two copolymers of PVA were prepared, one of which was precipitated from dilute solution by aluminum sulfate and ferric chloride, the other by acidification. Preliminary sizing trials with small samples of materials indicate that these, or similar, copolymers may be effective, recoverable warp sizes. Evidence was obtained that acclimatization of sewage bacteria to CMC and PVA occurs upon prolonged contact in a laboratory activated-sludge unit. (Lowry-Texas) W72-12282

DEVELOPMENT OF TECHNIQUES FOR ESTI-MATING THE BACTERIAL POPULATION OF

MATING THE BACTERIAL POPULATION OF SEWAGE SLUDGE, Midwest Research Inst., Kansas City, Mo. W. J. Spangler, and W. Langston. Copy available from GPO Sup Doc EP2.10:17070 DRP 12/70, \$1.00; microfiche from NTIS as PB-211 246, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1970. 84 p, 5 fig, 34 tab, 22 ref. EPA Program 17070 DRP 12/70.

Descriptors: *Anaerobic digestion, *Methane bacteria, *Anaerobic bacteria, *Sewage sludge, Sludge digestion, *Waste water treatment, Waste treatment, Water pollution control, Biomass. treatment, Water poliution control, Biomass. Identifiers: *Anaerobic techniques, *Roll-tube procedures, *Anaerobic sludge extracts, *Sludge factor assay, Sludge factors, Obligate anaerobes, Anaerobic culture media, Digester failure, Sludge

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

This research program was initiated to develop practical methods for evaluation of the biomass in anaerobic sewage sludge and to determine if predictions could be made concerning digester performance. Sampling and handling methods were improved and standardized to give maximum anserobic counts. A simplified technique for growing obligate anaerobes that can be safely performed by technicians with minimum training in bacteriology was developed. Anaerobic media were improved to yield as high or higher counts of methanogenic bacteria than heretofore reported. A simple freeze-dry technique was developed for preparation of consistent batches of sludge supernatant used in media as a supplement for growth obligate sludge anaerobes. The possible relationship between concentration of a growth factor required by Methanobacterium ruminantium (used to evaluate potency of growth factor extracted) and digester efficiency could have important practical implications. Limited data obtained indicated that growth factor concentrations were much higher in formed diseaser at the intention when the program is unphaleaged or tical implications. Limited data obtained indicated that growth factor concentrations were much higher in 'normal' digesters than in unbalanced or 'upset' digesters. Practical applications of the methods developed can have considerable impact upon future research and development in anaerobic sludge digestion and could lead to improvements in our ability to predict impending digester failure and control of digester performance. (Low-ry-Texas)

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RECYCLING OF SALINE WASTES,
Montana State Univ., Bozeman.
R. L. Sanks, and W. J. Kaufman.
Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 333-344, 1 fig.

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Effluents, Resins, Activated sludge, Dissolved solids, Efficiencies, Pre-treatment (Water), Coagulation, Filtration, Sands, Activated carbon, Total costs, Cost comparisons, Operating costs, Capital costs, Distillation, Electrodialysis, Laboratory tests, *Waste water treatment, *Desalination.

illentifiers: Strong acid resin, Weak-base resins, Fixed-bed ion exchange, Moving-bed ion exchange, *Saline wastes.

exchange, "Saline wastes.

A laboratory investigation was conducted in order to determine the optimization of operating variables such as flow rate, regenerant concentration and level of regeneration of an ion exchange system for the partial removal of dissolved minerals from an activated sludge plant effluent. The ion exchange system chosen for evaluation consisted of strong-acid and weak-base resins in fixed beds with a degasifier between the beds to remove carbon dioxide. Several salts were added to the secondary effluent to increase the TDS to 1200 mg/l. The exchange efficiency after pretreatment consisting of coagulation, sand filtration and carbon filtration was 83% for the cation-exchange resin and 86% for the anion-exchange resin and 86% for the anion-exchange resin Results of specific ion concentrations were arranged in tabular form. Total costs, including pretreatment, amortization, operating labor, chlorination, and waste disposal were estimated to be about \$0.52/1000 gal in a 1 mgd plant and about \$0.23/1000 gal in a 10 mgd plant for the removal of a use increment of 350 mg/l. This estimate included the thermal recovery of nitric acid and ammonia. Cost comparisons were made on a 10 mgd basis with a moving-bed, ion exchange system, an electrodialysis system and a split-treatment distillation system. (See also W72-12286 thru W72electrodialysis system and a split-treatment distil-lation system. (See also W72-12286 thru W72-12288) (Galwardi-Texas)

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES', Centre d'Etude de l'Energia Nucleaire, Mol (Belgium). L. H. Baetsle.

Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 345-347.

Descriptors: *Ion exchange, *Water reuse, *Cost comparison, Costs, Analysis, Quality control, Demineralization, *Desalination, *Waste water

Identifiers: Acid wastes, Sulfuric acid, Nitric acid, Sodium hydroxide, Belgium.

Sodium hydroxide, Belgium.

The paper of Sanks and Kaufman demonstrated the successful application of ion-exchange desalination of brackish water. However, due to the low cost of sulfuric acid it was felt that the technological complications of handling acid sludges by far surpass the gain made by recycling residual amounts of sulfuric acid. Also, the use of NH4OH instead of NaOH as regenerant for the anion exchanger can be justified only if the latter reagent is not available. The ratio between the prices of NH4OH and NaOH equals approximately 15 and the thermal recovery of ammonia mentioned in the paper was not very realistic. An economic comparison between the 1-mgd ion exchange plant and the 10,000 cu m/day water demineralization plant at the Belgian Nuclear Research Center at Mol was presented. Since analysis and quality control were not included in the desalination plant costs it was felt that the production costs were underestimated by about 50%. (See also W72-12285) (Galwardi-Texas) W72-12286

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES', Rohm and Haas Co., Philadelphia, Pa.

Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 347-349.

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Effluents, Resins, Volume, Alkalinity, Salinity, Lime, Efficiencies, Ammonia, Operating costs, Total costs, *Waste water treatment, *Desalination.

Identifiers: Resin makeup, Carboxylic-acid cation exchange resin, Regeneration.

The contribution of ion-exchange resin makeup to the overall cost and the volume of ion-exchange resins required were two aspects reviewed. The value of 5% resin makeup per year as stated by Sanks and Kaufman may be somewhat over optimistic, particularly with respect to the anion exchange. Considering the aggressive nature of the water, a makeup of 100%/year for the anion-exchange resin would be a more realistic value to exchange resin would be a more realistic value to use. It was felt that the volume of ion-exchange resins required was underestimated in that the resins required was underestimated in that the capacity may decrease during winter months, particularly at the high flow rates used. In view of the fact that the alkalinity present in most sewage effluents is almost equal to the salinity increment, one might use a carboxylic acid cation-exchange resin which would increase the overall ion-exchange capacity and acid-regeneration efficiency. Consideration of the use of lime slurries in place of ammonia for the regeneration of anion exchange resin, thereby lowering the cost of this phase of the regeneration was also mentioned. (See also W72-12285) (Galwardi-Texas) W72-12287

FORMAL DISCUSSION OF 'RECYCLING OF

FORMAL DISCUSSION OF RECYCLING OF SALINE WASTES', Bostock, Hill and Rigby, Birmingham (England). R. K. Chalmers.

Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 349-352, 2 tab,

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Dissolved solids, Lime, Chlorination, Pre-treatment, Bicarbonates, Demineralization, *Waste water treatment, *Desalination.

Identifiers: Lime softening, Use increment, Colony counts, Split elution, Strong-base resins.

Colony counts, Split elution, Strong-base resins.

The possible use of strong-base resins in place of weak-base resins which were used in the Sanks and Kaufman investigation was mentioned. In some special applications reverse phase demineralization on strong-base resins followed by strong-acid resins has some advantages. Also, split elution with saving of part of the regenerant for reuse, was found useful and economic even in small, fully automatic plants. Prechlorination prolonged the life of activated-carbon filters and kept ion-exchange resins virtually sterile. Typical colony counts were given. Also, the possible use of lime softening for the removal of a use increment of 350 mg/l was suggested especially where bicarbonate concentration was not a limiting factor. Furthermore, it was recommended that reclamation and saving of water start at the point of use. (See also W72-12285) (Galwardi-Texas)

PREDICTION OF PHOTOSYNTHETIC BIOMASS PRODUCTION IN ACCELERATED ALGAL-BACTERIAL WASTEWATER TREAT-

ALGAL-BACTERIAL WASTEWATER TREAT-MENT SYSTEMS, Hebrew Univ., Jerusalem (Israel). Dept. of Medi-cal Ecology. G. Shelef, M. Schwarz, and H. Schechter. Preprint, presented at 6th International Water Pol-lution Research Conference, Session 5, Hall A, Paper No 9, June 20, 1972. p A/5/9/1-A/5/9/10, 6 fig, 2 tab, 23 ref.

Descriptors: "Oxidation lagoons, "Algae, "Waste water treatment, "Mathematical models, Growth rates, Solar radiation, Flotation, Flocculation, Performance, Efficiencies, "Biomass, Organic matter, Nutrients, Photosynthesis.
Identifiers: Alum, Ferric chloride, "Jerusalem

The use of specially designed ponds as a controlled waste water treatment with maximized photosynthetic activity of algae was demonstrated. The kinetics of algae production with respect to solar incident irradiance served for the construction of a mathematical model for predicting algae biomass production and the concentration of algae as a function of hydraulic dilution rate under given levels of solar irradiance. The predicted levels of algae production and concentrations were close to actual levels, although in determining the optimal dilution rate, some corrections had to be made. The removal efficiency of organic matter and nutrients in the pond system was relatively high, provided the algae biomass was separated from the effluent. A 1,750 gal/hr rectangular flotator was used for separating the algal biomass from the pond effluent after treatment with alum or ferric chloride. Performance data of the accelerated photosynthetic pond for data of the accelerated photosynthetic pond for months June and December were arranged in tabu-lar form. (Galwardi-Texas) W72-12289

INFLUENCE OF MECHANICAL BLENDING ON AEROBIC DIGESTION OF WASTE AC-TIVATED SLUDGE, Windsor Univ. (Ontario). Dept. of Civil Engineer-

S. D. Bokil, and J. K. Bewtra. Preprint, presented at 6th International Water Pollution Research Conference, Session 6, Hall B, Paper No 11, June 20, 1972. p B/6/11/1-B/6/11/12, 9 fig, 1 tab, 7 ref.

Descriptors: *Activated sludge, *Sludge digestion, *Aerobic treatment, *Mixing, Hydrogen ion con-

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

centration, Oxygen demand, Laboratory tests, Performance, Time, *Waste water treatment. Identifiers: *Mechanical blending, Settleability, Oxygen uptake rates, Total plate counts, Bacterial

Laboratory studies were conducted to determine Laboratory studies were conducted to determine the influence of mechanical blending on aerobic stabilization of waste activated sludge. Also, the simultaneous influence of blending on settleability, pH, oxygen uptake rate, and total plate count was investigated. Results showed that the rate of auto-oxidation as well as settleability of the sludge were improved significantly following mechanical blending. The rate of auto-oxidation increased with an increase in the value of G theta, where G equals the mean velocity gradient im-pacted to the fluid mass, and theta equals the blending time, indicating that the higher the input blending energy the more rapid the auto-oxidation. Washing the sludge with 0.05 M phosphate buffer together with blending, further improved the auto-oxidation rate and the settleability. Also, the phosphate buffer prevented the pH from dropping to 5.0 - 6.5 during aerobic digestion. Oxygen up-take rates for blended sludge were higher than those for the control during the first few days. Also, bacterial counts in the supernatant of the control sample were higher than in the supernatant of the blended sludge. The coefficient of plastic viscosity was obtained from the concentration of suspended solids assuming the waste activated sludge as a Bingham plastic. (Galwardi-Texas)

THE MECHANISM AND DESIGN OF THE CON-TACT STABILIZATION ACTIVATED SLUDGE

California Univ., Berkeley. Sanitary Engineering

Research Lab.
D. Jenkins, and D. Orhon.

Preprint, presented at 6th International Water Pollution Research Conference, Session 5, Hall B, Paper No 10, June 20, 1972. p B/5/10/1-B/5/10/10,

Descriptors: *Activated sludge, *Design criteria, *Mathematical models, Laboratory tests, Microorganisms, Growth rates, Chemical oxygen demand, Performance, Organic loadings, Nitrifi-cation, Kinetics, Municipal wastes, *Waste water

Identifiers: Contact stabilization, Conventional decay rates, Sludge production rate, Sludge mass, Materials balance

An alternate mechanism for contact stabilization, that of rapid microorganism growth resulting in an that of rapid metroorganism grown resulting in an increase in the activated studge viable fraction during the contact period, followed by a death phase during the stabilization period was proposed. A mathematical formulation of a kinetic model based on material balances was presented. Laboratory studies were conducted so as to compare contact stabilization and conventional ac-tivated sludge systems. Significant advantages resulted from the ability to operate the contact sta-bilization system at a lower net growth rate than the conventional system at the same COD removal rate. The basis for this ability was the increase of the sludge mass decay rate at high COD removal rates. Important results observed were that the sludge production rate can be reduced, the loading at which nitrification is achieved can be increased and the sludge mass carried in the plant can be minimized because of its high viable organism content. (Galwardi-Texas) W72-12292

PERCOLATING FILTERS,

Water Pollution Research Lab., Stevenage (En-

gland). A. M. Bruce. Water Pollution Research Laboratory Reprint No 565, From Process Biochemistry, Vol 4, April 1969. 19 p, 3 fig, 1 tab, 26 ref.

Descriptors: *Waste water treatment, *Trickling filters, *Aerobic treatment, Bacteria, Fung Films, Worms, Biochemical oxygen demand Nutrient requirements, *Filters, Oxidation. Identifiers: Flies.

Aerobic oxidation of the organic fraction of sewage is the traditional method of waste water treatment. The purification action is accomplished by zoogleal or filamentous bacteria or by fungi which inhabit the film covering the filter media. Methods of controlling the film, the role of inver-tebrates in maintaining filter efficiency, seasonal effects, BOD loading and filter media are discussed. A good deal of empirical data has been accumulated over the years; however, the position has not been reached where predictions concern-ing filter performance can be made. (Goessling-W72-12293

RESEARCH DEVELOPMENT IN HIGH RATE BIOLOGICAL FILTRATION, Water Pollution Research Lab., Stevenage (En-

giand). A. M. Bruce, J. C. Merkens, and S. C. MacMillian. Water Pollution Research Laboratory Reprint No 615, From Institute of Public Health Engineers Journal, July 1970, p 178-207, 6 fig, 6 tab, 25 ref.

Descriptors: *Trickling filters, *Waste water treat-Descriptors: "Inckling filters, "Waste water treat-ment, Biochemical oxygen demand, Biodegrada-tion, Organic loading, Pilot plants, Flow rate, Nitrification, Coliforms, Temperature, "Filtra-tion, "Biological treatment. Identifiers: "High rate loadings, *Plastic media,

A great deal of interest is being shown by public health engineers in the possible advantages of high rate biological filters. The WPRL has constructed and operated six pilot plant filters packed with four plastic and two mineral media. These filters were operated for seven months at loads of 6 cubic meters per cubic meter per day and for five months at 12 cubic meters per cubic meter per day. Average BOD removal was related in a rather simple way to specific surface area. Temperature efects were pronounced and common to all filters. BOD remaining in effluent correlated with the concentration of suspended matter. Some soluble biodegradable components of the sewage were removed rapidly when compared to the overall BOD removal. Film accumulation was moderate throughout with the films on the mineral media being slightly thicker. No evidence of clogging could be detected. Sludge production was quite high compared to the BOD removed. Coliform bacteria removal efficiency was lower than in a low rate filter for the same sewage. Further study is required over a wider range of loadings and with ulation. (Goessling-Texas) W72-12294

TREATMENT OF CANNERY WASTES IN CALIFORNIA,

S. H. Jenkins. Effluent and Water Treatment Journal, p 39-42, January 1969. 4 fig, 3 tab.

Descriptors: *Treatment facilities, *Industrial wastes, *Canneries, *Municipal wastes, Organic loadings, Aeration, Nitrification, Activated sludge, Flotation, Performance, Efficiencies, Anaerobic digestion, Biochemical oxygen demand, Oxygen requirements, *Waste water treat-ment, *California.

Identifiers: Joint treatment, Kraus process, *San Jose (Calif), Retention periods, Tank volumes,

The ability of the San Jose and Santa Clara, California water pollution control plant to deal with an extremely heavy load of cannery waste was described. Influent characteristics compared for non-canning and canning seasons showed an

increase in flow from 56 to 77 mgd, an increase of BOD from 210,000 lb/day to 530,000 lb/day and an increase in suspended solids from 230,000 lb/day to 320,000 lb/day. Oxidation of settled sludge has been accomplished by the Kraus nitrified sludge interchange process in which the sewage is treated with activated sludge which has been nitrified in admixture with supernatant liquor from the sludge digestion tanks. Required aeration and nitrification tank volumes, retention periods, total air requiredigestion tanks. Required aeration and nitrification tank volumes, retention periods, total air requirements and BOD loadings were compared for canning and non-canning seasons. Sludge concentration has been accomplished by using a dissolved air flotation principle. Thus, with a retention period of under one hour, a concentrated sludge has been obtained continuously and considerable diseater conceits her been saved. Effluent results digester capacity has been saved. Effluent results showed a 90% removal of BOD during the non-canning season and 92% during the canning season. (Galwardi-Texas)

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A SIMULATION MODEL OF THE GRAVITY SEPARATION OF CONCENTRATED SOLIDS, Engineering-Science, Inc., Arcadia, Calif. A. S. Anderson, and R. C. Hanson.

Preprint, presented at 6th International Water Pollution Research Conference, Session 6, Hall B, Paper No 12, June 20, 1972. p B/6/12/1-B/6/12/15, 10 fig, 6 ref.

*Simulation analysis, *Settling Descriptors: velocity, *Activated sludge, *Mathematical models, Gravity studies, Laboratory tests, Digital computers, Computer models, Computer programs, Time, Depth, Model studies, *Waste water treatment, Separation techniques. Identifiers: Settling test, Solids separation, Thickener, Sludge blanket.

The simulation model presented was programmed for use with a digital computer and provides an ef-fective means of dynamically simulating the settling test and for predicting the performance of a thickener. The first stage development work resulted in a program for the analysis of the set-tling test which enabled determination of an additional mathematical contact which relates to some basic properties of the sludge to be separated. This program was then modified in stage two to include the continuous addition and removal of solids and the program is an effective simulation of a typical separator. Both computer programs were presented in detail. The simulation model approximating the behavior of the settling test assumed layers of finite thickness exist and further assures that small real increments of time elapse before changes in layer parameters occur. The position of the solid-liquid interface was computed from the volumetric changes in the layers. The continuous thickener program computes the number of layers in the fixed volume removed and adjusts the layer number to compensate for the removed layers when the number of layers removed is equal to the number of layers added in one hundred time periods the program halts and the depth of the sludge blanket is pointed out. (Galwardi-Texas) W72-12296

5E. Ultimate Disposal of Wastes

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Detroit, Mich. For primary bibliographic entry see Field 05G. W72-11956

THE PESTICIDE MANUFACTURING INDUS-TRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES, Texas Univ., Austin. Dept. of Civil Engineering. For primary bibliographic entry see Field 05D. W72-12009

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

WASTE TREATMENT APPARATUS. Tesco Chemicals, Inc., Atlanta, Ga. For primary bibliographic entry see Field 05D. W72-12149

5F. Water Treatment and **Quality Alteration**

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PRACTICAL CONSIDERATIONS IN DEFINING QUALITY WATER, Saint Louis County Water Co., University City, Mo. For primary bibliographic entry see Field 05G. W72-11901

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED STATES, 1962, Geological Survey, Wash., D.C. Water Resources

For primary bibliographic entry see Field 03D. W72-11905

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER, Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W72-11906

WATERSHED MANAGEMENT AND RESERVOIR USE-JOINT DISCUSSION, California State Dept. of Public Health, Berkeley; and Seattle Dept. of Water, Wash. H. J. Ongerth, E. J. Allen, and W. R. La Due. Journal of the American Water Works Associa-tion, Vol 56, No 2, p 149-168, February 1964. 18

Descriptors: *Public health, *Recreation wastes, *Diseases, Boating, Recreation demand, Recreation facilities, Forest fires, Swimming, Fishing, Sking, *California, Bacteria, Viruses, Water supply, Political aspects. Identifiers: *Gastrointestinal disease, *AWWA Policy Statement, California State Board of Health, Litter, Picnicking, Purveyors.

The public health viewpoint, the purveyor's viewpoint and future trends of recreation use of water supply watersheds are presented. Multiple protection is advocated to prevent human wastes from entering water supply systems. An investigation of 'open' and 'closed' reservoirs in California revealed little difference in coliform organism concentration when reservoirs' are open to the public or are closed. Proper management and control are stressed because of the purveyor's responsibility for a safe water supply. Increasing demands for recreational use of watersheds must be met through management and control and not by arbitrary prohibition. The water utility manager must take an active role in informing the public of the value of pure water and the need for safeguards. (Flack-AWWARF)

RELATION OF RIVER POLLUTION TO PUBLIC WATER SUPPLY IN EUROPE AND THE UNITED STATES, Amsterdam Water Works (Netherlands).

Journal of the American Water Works Associa-tion, Vol 55, No 7, p 917-928, July 1963. 5 fig, 3

Descriptors: Water pollution, *Storage, *Water treatment, Water sources, *Biologic treatment, *Oxygenation, *Oil fields, Artificial recharge, Pathogenic bacteria, Demineralization, Chloride, Salinity, Water supply, United States, Dissolved oxygen, Oil wastes, Mine wastes, Low flow.

Identifiers: *Deoxygenation, *Rhine River, *Ar-kansas River, Pathogens, Europe, Amsterdam (Holland), European Economic Community, Rus-

Three major sources of public water supply are groundwater, river water in mountains, and river or lake water in the plains. Pollution treatment in the latter faces problems of low flow and high pollution, mine and oil wastes, rapid fluctuations in chemical composition, pathogens and industrial spills. The Rhine and Arkansas Rivers are cited to contrast American treatment which emphasizes rapidity and storage of weeks or months. Long storage alleviates many river pollution problem Underground storage by artificial recharge may be best. (Flack-AWWARF) W72-11918

AN ACT RELATING TO WATER PURIFICA-TION AND WASTE WATER TREATMENT OPERATORS. For primary bibliographic entry see Field 06E. W72-11950

REASSESSMENT OF THE VIRUS PROBLEM IN SEWAGE AND IN SURFACE AND RENOVATED WATERS, National Environmental Research Center, Cincinnati, Ohio. For primary bibliographic entry see Field 05D. W72-12061

WATER TREATMENT PLANT, Neptune Microfloc, Inc., Corvallis, Oreg. W. F. Ettlich. U. S. Patent No. 3,545,619, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 881, No 2, p 594, December 8, 1970.

Descriptors: *Patents, *Water treatment, Treatment, *Filtration, *Flocculation, *Settling basins, Separation techniques, Equipment, Treatment facilities, Waste water treatment, Water pollution treatment, Pollution abatement, Water purifica-

The water treatment plant consists of a settling basin, a filtering basin, and a mixing basin. Raw water is fed to the mixing basin and then to the flocculator and thereafter is led into the settling basin. The water is then directed to flow over the filter media and then out to a clearwell. Backwash from the filter may be returned to the settling basin for recirculation. (Sinha-OEIS) W72-12140

WATER TREATMENT,

Combustion Engineering, Inc., New York.
I. P. Mail, and J. R. Kennett.
U. S. Patent No. 3,542,675, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1422, November 24, 1970.

Descriptors: *Patents, *Water treatment, *Waste water treatment, Pollution abatement, Separation techniques, *Suspended solids, Gases, Bubbles, Aeration.

Contaminated liquid having particles of solid foreign matter suspended therein flows through a container. Liquid saturated with gas passes through a venturi structure which reduces the pressure on the saturated liquid to enable bubbles of gas to form. The flow rate of the gasified liquid is controlled to maintain a predetermined ratio to the flow rate of the contaminated liquid flowing through the container. (Sinha-OEIS)

THE URBAN WATER SYSTEM-ECONOMIC ASPECTS, Water Resources Engineers, Inc., Walnut Creek, Calif.

For primary bibliographic entry see Field 06A. W72-12223

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY,

Denver Board of Water Commissioners, Colo. For primary bibliographic entry see Field 06A. W72-12232

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12236

5G. Water Quality Control

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Gutteridge, Haskins and Davey, Melbourne (Australian Control of Cont tralia). For primary bibliographic entry see Field 03C. W72-11769

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Melbourne Univ., Parkville (Australia). For primary bibliographic entry see Field 03C.

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT, Water Conservation and Irrigation Commission,

Sydney (Australia). For primary bibliographic entry see Field 03C. W72-11771

POLLUTION OF SURFACE WATERS AND BIOLOGICAL PURIFICATION: VARIOUS

ASPECTS, State Coll. of Agronomical Science, Gembloux (Belgium). P. Manil.

Ann Gembloux. Vol. 77, No. 1, p 23-37. 1971. Identifiers: Bacteria, Biocontrol, *Water purification, *Water pollution.

The reversal of the process of pollution involves the microbial degradation of the pollutants into CO2, ammonia, phosphate and S and a sedimentation of the organic and inorganic particles to the bottom. These mechanisms are of course limited in that there is only so much that bacteria can handle as well as a fixed amount that can be sedimented. as well as a fixed amount that can be sedimented. The levels of self purification, the speed of the process and the specific activity of the pollutant biomass are all expressed mathematically. The factors involved are the quantity of the biomass, the spacial distribution of the mass, the time that the pollutant substances are exposed to the purification media, the qualities of the pollutant, the emperature, and the O2 tension of the biomass.—Copyright 1972, Biological Abstracts, Inc. W72-11792

WATER: LIVING MILIEU, State Coll. of Agronomical Science, Gembloux (Belgium). R. Baurant.

Ann Gembloux. Vol 77, No 1, p 5-21. 1971.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

Identifiers: Wildlife, Flora, Public health, Plants, Pollution, *Water pollution, *Life cycles, *Ecolo-

Water is essential for the health of man, as it is a necessary body fluid, and as a biological medium which supports a needed biological system. The which supports a needed notogical system. The life cycle in water involves the transformation of inorganic matter by the plants, with the help of the sun, into organic matter which is then used as a food by the abundant animal life. These water sources include both stagnant bodies such as lakes and flowing entities as rivers and streams. Each of these types has its own characteristic flora and fauna which owes a large measure of its distinction to this quality of movement. Pollution is a grea danger as the waste, besides poisoning the animal life, will cause a decrease in the amount of dissolved O2 in the water as the number of unicellular organisms increases.—Copyright 1972, Biological Abstracts, Inc. W72-11804

AN IMPROVED OPTIMUM CONTROL AL-GORITHM FOR A CLASS OF WATER POLLU-TION PROBLEMS,

Newark Coll. of Engi neering, N.J.

H. J. Perlis, and A. R. Cook. ISA Transactions, Vol. 10, No. 4, p 333-339, 1971.

Descriptors: *Water quality control, *Algorithms, Mathematical studies, *Model studies, Equations, Mathematical models, Distribution, Control systems, Biochemical oxygen demand, Streams, *Dissolved oxygen, Water pollution, *Aeration, Water pollution control, Effluents, Water manage

A description is presented of a mathematical and computer algorithm based upon the techniques of Pontryagin's Maximum Principle (a tool of modern optimal control theory). The algorithm can be applied to a broad clas of multivariable distributed process, and is especially applicable to a dynamic water pollution problem, i. e., water quality control in a polluted stream. The technique uses a modified Streeter and Phelps dissolved oxygen model along with a two-element control vector: one for artificial aeration control and the other for effluent control. Examples are given which illustrate the overall control management policy. (Mackan-Battelle) W72-11807

ROTENONE TOLERANCE IN MOSQUITOFISH, Mississippi State Univ., State College. Dept. of For primary bibliographic entry see Field 05C. W72-11846

OIL POLLUTION OF WATER SUPPLIES-TASK

GROUP REPORT.

American Water Works Association, New York. Committee on Oil Pollution of Water Supplies.

Journal of the American Water Works Association, Vol 58, No 7, p 813-821, July 1966. 13 ref.

Descriptors: *Oil pollution, *Water pollution sources, *Water quality control, *Oily waters, *Oil industry, *Fuel, *Oil wastes, Waste identification, Maps, Industrial wastes, Communication. Identifiers: *Oil pipelines, Trains, Trucks, Oil tankers, Crude oil, Hydrographic maps.

Task Group findings were: (1) Oil spills may contaminate public water supplies, (2) Large spills most frequently come from oil pipelines, (3) Damage may be avoided or reduced by location of points of possible spills, knowing time of travel to intake and intermediate points of storage, having an early warning system and establishing emergency plans, equipment and treatment. (4) Effective

communication and planning among water indus-try and oil industry are essential. (5) Personnel transporting or storing oil should be better in-formed on oil pollution hazard. (Flack-AWWARF)

TOMORROW'S METHODS TO PROVIDE TOMORROW'S SERVICE, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.

Journal of the American Water Works Associa-tion, Vol 58, No 8, p 938-952, August 1966. 2 tab,

Descriptors: *Population, *Water demand, *Water treatment, *Water quality control, *Rates, *Water sources, *Instrumentation, Water reuse, Water Resources Planning Act, Competing uses, Public health, Long term planning, Economics, Aesthetics.

Identifiers: Water Research Association (British), Comprehensive planning, Regional distribution.

The slow rate of change in the water industry is due to a virtual absence of commitment to research. Several approaches are suggested; (1) research at existing facilities, (2) regulatory agen-cies encourage inovation, (3) establish an industry research organization, (4) industry sponsored university research. Tomorrow's water needs require comprehensive planning, regional distribu-tion, new sources, aesthetic improvements, improved water quality through new treatment, improved instrumentation and control and new levels of trained leadership in the water industry. (Flack-AWWARF) W72-11894

RECREATIONAL USE OF WATERSHEDS--JOINT DISCUSSION,

Washington Suburban Sanitary Commission, Hyattsville, Md.; Sport Fishing Inst., Washington, D. C.; Maryland State Dept. of Health, Baltimore; and Public Health Service, Washington, D.C. For primary bibliographic entry see Field 06D. W72-11896

NEW LOOK AT RESOURCES POLICY. Cornell Univ., Ithaca, N.Y. Coll. of Engin For primary bibliographic entry see Field 06B.

PRACTICAL CONSIDERATIONS IN DEFINING QUALITY WATER,

Saint Louis County Water Co., University City,

H. O. Hartung. Journal of the American Water Works Associa-tion, Vol 57, No 3, p 286-292, March 1965. 1 tab, 10

Descriptors: *Water pollution, *Standards, *Water quality, Water sources, Water pollution control, Specifications, Taste, Odor, Color, Tur-

idity.

Identifiers: *USPHS Drinking Water Standards, Chemical stability, Carbon chloroform extract, Consumer demand, Organic content, Bacterial content, AWWA Water Quality Standards.

A quality water is one suited to the needs of the users. A minimum quality for utilities is the USPHS Drinking Water Standards, but these apply only to health aspects. Quality water specifications and the second cations are related to raw water quality, treatment facilities available, costs of treatment and commu-nity preferences. Pollution control of the raw ntty preferences. Pollution control of the raw water source is a responsibility of the water utility. A national professional water quality standard serves as a useful guide. The proposed American Water Works Association provisions deal with uniformity of quality, turbidity, carbon chloroform extract, chemical stability, bacterial content and taste and odor. Utilities must be continuously alert to changing conditions of raw water quality and treatment capabilities to provide a true quality water. (Flack-AWWARF) gives sure St art yall ot tie

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DUAL WATER SYSTEMS, Black and Veatch, Kansas City, Mo. For primary bibliographic entry see Field 03D.

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER, Washington Univ., Seattle. Dept. of Civil En-

gineering. R. O. Sylvester, and R. W. Seabloom. Journal of the American Water Works Associa-tion, Vol 57, No 12, p 1528-1546, Dec. 1965. 11 fig, 4 tab, 24 ref.

Descriptors: *Reservoir sites, Water resources development, Water quality, Soil investigations, *Impounded waters, Impoundments, *Dissolved oxygen, Biochemical oxygen demand, Algal control, *Color, *Alkalinity, *Nitrates, Nitrogen, *Conductivity, *Leaching, Iron, Temperature, Soil analysis, Taste-producing algae, Hydrogen ion concentration, *Organic soils, Mineralogy. Identifiers: Wood, Algal count, Green River, Washington, Howard A. Hanson Reservoir. Washington, Howard A. Hanson Reservoir, Tacoma (Wash).

Soils at impoundment sites should be tested for soils at important and see should be tested to their effect on overlying water. Organic soils create the most severe problems but leaching them or covering them with as little as 2 inches of mineral soil may be effective. Tests were permineral soil may be effective. Tests were per-formed on Howard A. Hanson Reservoir, near Tacoma, Washington, to ascertain physical, chemical and biologic effects. Based on these stu-dies, recommended water quality tests over soils of impoundments should include DO, color, nitrate, ammonia, algal counts and pH measure-ments of at least one month duration. Leaching and exchange studies will reveal if site should be abandoned or if cover soil is feasible. Shorelines should be investigated for effect on turbidity. Complete water quality analyses under various flow conditions are needed to evaluate future reservoir quality as related to the underlying soil. (Flack-AWWARF) W72-11906

WATERSHED MANAGEMENT AND RESER-VOIR USE-JOINT DISCUSSION,

California State Dept. of Public Health, Berkeley; and Seattle Dept. of Water, Wash. For primary bibliographic entry see Field 05F. W72-11907

DETERMINATION OF STREAM USE. Philadelphia Water Dept., Pa.

Journal of the American Water Works Associa-tion, Vol 56, No 10, p 1285-1289, October 1964. 1

Descriptors: *Cost-benefit analysis, *Competing uses. *Mathematical models, *Waste water treatment, *Water pollution treatment, *Water pollu-tion control, Water quality control, Viruses, Delaware River, Standards.

Identifiers: *Stream standards, Ruhr Valley, Torresdale Water Treatment Plant (Philadelphia)

Using the waste assimilation capacity of a stream is economic and realistic. The problem is intensive use of the fixed supply of water. One idea is to allocate different uses to different streams as in the Ruhr Valley. The ability of modern treatment to produce safe water from badly polluted sources should be recognized. Consideration should be

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

given to removing viruses at the treatment plant rather than at the waste disposal plant but wastes such as pesticides which are difficult to remove in treatment should be controlled at the source. Stream Standards should be based on benefit-cost Stream Standards should be based on benefit-cost analysis and flexible requirements for water quality established based on costs. Citizens should be able to compare pollution abatement costs with other community costs to establish relative priorities. (Flack-AWWARF) W72-11910

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DEVELOPMENT AND EFFECT OF THE DELAWARE RIVER BASIN COMPACT, New York City Board of Water Supply. For primary bibliographic entry see Field 06E. W72-11915

MONITORING FOR EFFECTIVE ENVIRON-MENTAL MANAGEMENT, Battelle Memorial Inst., Columbus, Ohio. Colum-bus Labs.

For primary bibliographic entry see Field 05A. W72-11921

A POSTSCRIPT TO CALVERT CLIFFS', N.J. Landau. Boston College Industrial and Commercial Law Review, Vol. 13, p. 705-717, (1972). 61 ref.

Descriptors: "Regulation, "Administrative agencies, "Legal review, "Thermal pollution, Judicial decisions, Legal aspects, Legislation, Water quality, Nuclear powerplants, Nuclear energy, Environmental effects, Construction, Nuclear explosions, Nuclear wastes, Permits, Federal government

Identifiers: *Environmental Protection Agency *Atomic Energy Commission.

Recently the United States Court of Appeals for the District of Columbia held that the procedures of the Atomic Energy Commission failed to comply with the requirements of the National Environmental Policy Act. Subsequently the Commission filed new procedures for investigating the environmental impact of projects requiring the approval of or undertaken by the Commission. As prescribed by NEPA, the Commission must accumulate and assess environmental information and investigate environmental impacts, including those mutate and assess environmental information and investigate environmental impacts, including those which may affect thrmal and other water quality standards. Despite the new procedures environmentalists alleged that the Commission's impact statement on the Amchitka nuclear test failed to statement on the Amchitka nuclear test failed to include relevant data and reports from other agencies and sought to enjoin the blast. The Commission relied on executive privilege by virtue of national defense. The Supreme Court refused to enjoin the blast. This decision failed to give the provisions of NEPA the broad application they had been given in the past. Continued government reliance on the executive privilege in order to avoid compliance with NEPA provisions seems likely. This will consequently reduce the effectiveness of the Act. (Brackins-Florida)

CONTROLLING GREAT LAKES POLLUTION: A STUDY IN UNITED STATES-CANADIAN EN-VIRONMENTAL COOPERATION, Wisconsin Univ., Madison. School of Law. B. B. Bilder

Michigan Law Review, Vol. 70, p. 469-556, 1972. 288 ref.

Descriptors: *International Joint Commission, *International commissions, *Great Lakes, *Pol-lution abatement, Cooperation, United States, Canada, Treaties, Federal government, International law, International waters, Comprehensive planning, Legal aspects, Boundaries (Surfaces), Water quality control, Water quality standards, Environmental control.

The proposed Great Lakes Water Quality Agreement between the U.S. and Canada would establish common water quality objectives, commit the two governments to the development of compatible national water quality standards, and provide for a wide variety of joint and separate pollution control programs and related measures. The development of Great Lakes environmental concertaing is examined in terms of framework. The development of Great Lakes environmental cooperation is examined in terms of framework, institutions, and history. This includes discussion of the 1909 treaty, the resulting International Joint Commission and its procedures, the Commission's activities regarding pollution, and the proposed Agreement. Some aspects of the U.S.-Canadian experience are discussed, including the need for international cooperation; the role of legal prohibitions and remedies; the institutional structures of the Commission; and the problem of determining objectives, apportioning burdens, coordination, and implementation. Comments on the proposed Agreement's general significance and the long-term prospects for American-Canadian Great Lakes cooperation are included. (Widman-Florida) W72-11939

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER-LEGISLATIVE REFORMS TO IMPROVE THE BALANCING

PROCESS, Atomic Energy Commission, Washington, D.C. For primary bibliographic entry see Field 06E. W72-11940

INTERNATIONAL CONFERENCE ON OCEAN

For primary bibliographic entry see Field 06E. W72-11941

WATER POLLUTION-CONTROL OF NUTRIENTS-CLEANING AGENTS-WATER CONDITIONERS. For primary bibliographic entry see Field 06E. W72-11942

CONSERVATION OF FISHERIES RESOURCES. For primary bibliographic entry see Field 06E. W72-11943

INTERNATIONAL ASPECTS OF THE 1972 EN-VIRONMENTAL PROGRAM, Executive Office of the President, Washington,

For primary bibliographic entry see Field 06E. W72-11947

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-202 183D, \$3.00 in paper copy, \$0.95 in microfiche. July 22, 1971. 13 p, 1 fig, 1

Descriptors: "Michigan, "Environmental effects, "Dredging, "Sediments, "Water pollution sources, "Lake Michigan, Water pollution, Water quality, Water pollution control, Campel improvement, Harbors, Great Lakes, Pollution abatement, Project benefits, Project purposes, Dikes, Spoil banks, Aesthetics, Land use, Navigation. Identifiers: "Environmental Impact Statements, "Grand Haven Harbor (Mich). *Grand Haven Harbor (Mich).

This project will remove polluted dredging material from the water of Lake Michigan by disposal in a diked area established to contain the polluted spoil. Channel and harbor improvement in Grand Haven Harbor requires annual maintenance dredging. This project will convert an

aquatic/marsh area to a terrestrial condition. The proposed site is not a virgin marsh, since it has been used for spoil and trash disposal in the past. Use of the disposal area for the confinement of polluted dredging material will lessen further pollution of Lake Michigan. Use of the containment site will remove or destroy aquatic animal and plant life now inhabiting the area. Construction of a transmission pipeline, a pump-out station and dikes will have an adverse impact on visual aesthetics in the area. Alternatives include no project, which means acceptance of the detrimental environmental impact; discontinuance of the maintenance and dredging operations; removal of the pollutants from the spoil before disposal; or using alternative spoil disposal sites. (Brackins-Florida)

CONTIGUOUS ZONES FOR POLLUTION CON-

TROL,
For primary bibliographic entry see Field 06E.
W72-11960

KALLEVIG V. HOLMGREN (SEPTIC TANK EF-FLUENT HELD NOT COMMON ENEMY). For primary bibliographic entry see Field 06E. W72-11962

SIGNING OF GREAT LAKES WATER QUALI-TY AGREEMENT, For primary bibliographic entry see Field 06E. W72-11964

STATE CONSTITUTIONS AND THE ENVIRON-

MENT, Virginia Univ., Charlottesville. School of Law. For primary bibliographic entry see Field 06E. W72-11971

PUBLIC REGULATION OF WATER QUALITY IN VIRGINIA, W. Turner, Jr. William and Mary Law Review, Vol 13, p 424-476,

Descriptors: *Virginia, *Water quality control, *Water pollution, *Legal review, Legislation, Judicial decisions, Legal aspects, Regulation, Administrative agencies, Adoption of practices, Comprehensive planning, State governments, Social aspects, State jurisdiction, Federal jurisdiction, reasonable use, Water policy, Project planning, Comparative costs, Pollution abatement, Tidal waters.

Identifiers: *Virginia Water Control Act.

Early pollution problems in Virginia arose in the tidewater region; court cases and legislation relating to tidewater pollution are examined. Inland water pollution legislation is also discussed. The main thrust is a discussion of the water control law main thrust is a discussion of the water control law of Virginia. The Water Control Board is the major administrative arm under the act. The broad scope and jurisdiction of the act is examined in detail in reference to the following: geographic jurisdiction, types of pollution, persons subject to jurisdiction, and jurisdictional limits. The surveillance and enforcement powers of the Board include: regional organization, special investigative teams, mechanical monitoring stations, and reports from other agencies. State policy is directed at abating pollution and preventing future pollution; however, no policy is set for how fast this is to occur. Policy is analyzed as it relates to industry, municipalities, water quality preservation, and try, municipalities, water quality preservation, and waste treatment. Problem areas and loopholes discussed include: sedimentation and erosion, discussed include: segmentation and erosion, urban runoff and storm sewers, pollution from vessels, wetlands, and interstate compacts. A major flaw in the Virginia scheme is the test of reasonableness, which hampers efforts to clean the state's waters. (Grant-Florida)

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

W72-11972

INDIVIDUAL LEGAL REMEDIES AGAINST POLLUTION IN ILLINOIS, Illinois Inst. of Tech., Chicago. Kent Coll. of Law. For primary bibliographic entry see Field 06E.

ADMINISTRATIVE, JUDICIAL AND NATURAL SYSTEMS: AGENCY RESPONSE TO THE NA-TIONAL ENVIRONMENTAL POLICY ACT OF

For primary bibliographic entry see Field 06E.

VOLUME WEIGHT OF RESERVOIR SEDI-MENT IN FORESTED AREAS, Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station. For primary bibliographic entry see Field 02J.

WASTE WOOL AS A SCAVENGER FOR MER-CURY POLLUTION IN WATERS, Little (Arthur D.), Inc., Cambridge, Mass.

P. Tratnyek.

Copy available from GPO Sup Doc EPA 16080 HUB 04/72, \$0.60; microfiche from NTIS as PB-211 128, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 49 p, 2 fig, 16 tab, 10 ref. EPA Program 16080 HUB 04/72.

Descriptors: *Mercury, *Sorption, *Separation techniques, Sediments, Performance, Temperature, Hardness (Water), Anaerobic conduitons, Sulfur, Laboratory tests, Feasibility studies, Water quality control, Hydrogen ion concentratives.

Identifiers: *Wool, *Waste fiber utilization.

Laboratory studies demonstrated the feasibility of using waste wool and wool/polyester blend fibers to remove mercury pollution from waters and bottom deposits. Nylon fiber was shown to have limited potential. Within 24 hours, 90-95% of mercury at the 1-ppm level was removed by the wool fiber. At higher levels of mercury, larger quantities were removed, but the percentage decreased. Changes in pH (2 to 10) and temperature (5 to 35C) did not markedly alter efficacy of wool, nor did anaerobic conditions or variation in water hardness. However, the presence of sulfide in water or sediment reduced effectiveness of wool. Sources of mercury used were mercuric chloride, methyl mercuric chloride, phenyl mercuric acetate, bis (2methoxyethyl) mercury, and dissolved metallic mercury. (Lowry-Texas) W72-12008

NATURAL AREAS, For primary bibliographic entry see Field 06G. W72-12039

SELF PURIFICATION IN SEWERS. Los Angeles County Sanitation Districts, Calif. R. D. Pomeroy, and J. D. Parkhurst. Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall C, Paper No. 21, June 22, 1972, 16 p, 7 fig, 2 tab, 3

Descriptors: *Sewers, *Biodegradation, *Aeration, Temperatures, Slopes, Flow rates, Turbulence, Slime, Mass transfer, Dissolved oxygen, Waste water treatment, *Water purification, *Self-purification, Water quality control, Reaera-

Identifiers: *Oxygen reaction rates.

Both laboratory and full-scale testing have demonstrated that oxygen reaction rates in sewage vary

widely. Investigations showed that oxygen reacwhitely investigations showed that oxygen reach tion rates are low near the origin of the sewage, in-creasing for several hours if aerobic conditions prevail, up to rates as high as 20 mg/l-hr., then declining. By using a predictive equation for reaeration and measuring the rates of use of ox-ygen by the sewage, calculations were made of the rate of oxygen utilization by the slime layer on the pipe wall. It was hypothesized that in the sewers tested the slime layer acted as an efficient sink for the oxygen reaching it. Rate of loss of oxygen to the stime layer was predicted by development of a formula. Since a substantial amount of biological oxidation occurs in some sewers, particularly where the oxygen supply is augmented by the turbulence produced at junctions and other structure. tures, sewers should be designed in ways to max-imize aeration so that sufficient biodegradation may be induced to effect substantial BOD load reductions to the treatment plants. (Lowry-Texas) W72-12047

REGIONAL WASTEWATER MANAGEMENT SYSTEMS FOR THE CHICAGO METROPOLITAN AREA-SUMMARY REPORT, Office of the Chief of Engineers (Army), Washing-For primary bibliographic entry see Field 05D. W72-12055

SUBMERSIBLE WATER QUALITY MONITOR-ING EQUIPMENT, Water Pollution Research Lab., Stevenage (En-

gland). ary bibliographic entry see Field 05A. W72-12058

THE POTENTIAL ROLE OF EFFLUENT CHARGES IN WATER QUALITY MANAGE-

MENT, Secretariat Permanent pour l'Etude des Problemes de l'Eau, Paris (France). J. F. Saglio, and J. Garancher.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall A, Paper No 28, June 22, 1972. 6 p.

Descriptors: *Water pollution control, *Waste assimilative capacity, *Water quality standards, Domestic wastes, Industrial wastes, Legislation, Assessments, Waste water treatment, *Pollution taxes (Charges).
Identifiers: *France, *Effluent charges.

Assignment of a financial schedule in France by which participating industries are assessed in relation to the pollutional load in their effluents has further stimulated industrial efforts at pollution abatement by effluent reduction and other methods. The development of the plan has in-cluded a national survey of water quality and of industrial effluents to determine both the pollution potential of the wastes as well as the waste assimilative capacity of the stream. Problems encountered in determining effluent discharge limits and assigning the proper cost to each discharge were caused primarily by the fact that only a range of probabilities were available as to whether or not an effluent would cause damage. Through cooperation with the industries, and a careful scrutiny of all discharge standards by the regulatory agency, settlements have been agreed upon and the entire program of pollution abatement is functioning well as both a water pollution control scheme and an industrial location development scheme. (Lowry-Texas)

SAND AND GRAVEL OVERLAY FOR CONTROL OF MERCURY IN SEDIMENTS, Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies. L. H. Bongers, and M. N. Khattak.

Copy available from GPO Sup Doc EPA 16080 HVA 01/72, \$0.55; microfiche from NTIS as PB-211 165, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 45 p, 12 fig, 10 tab, 28 ref. EPA Program 16080 HVA 01/72. REGRETA AS WE FO

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Descriptors: *Mercury, *Sediments, *Sands, Anaerobic conditions, Aerobic conditions, Deposition (Sedimentation), Laboratory tests, Toxicity, Economic feasibility, Technical feasibility, Water quality control. Identifiers: "Sand blankets, "Mercury release, *Ascorbate.

The release of toxic mercurials by mercury-en-riched river sediments was examined in the labora-tory. Tests showed a release of 1 microgram of methylmercury per m2, per day. Methylmercury occurred in sediments with low and with high organic content, in sediments with low and high cation exchange capacity, and in aerobic and anaero-bic sediments. The release of toxic mercury could be prevented by a layer of sand, 6 cm in thickness, applied over the mercury-enriched sediments. Layers of fine or coarse gravel (6 cm deep) were as effective as sand. Thinner layers of sand, (1.5 and 3 cm) were unsatisfactory. The cost of applying 3-inch layers of sand or gravel was about \$3000 to \$4000 per acre. A slow release of metallic mercury occurred in aerobic sediments. The release was much faster in anaerobic sediments. Using ascorbate as an artificial electron donor, metallic mercury could be released at high rates from aerobic sediments as well. Ascorbate appeared to be a useful indicator of divalent and biologically accessible mercury. The laboratory investigations proved the soundness of the sand blanket approach. Its practical and economic feasibility must be determined in a combined field and laboratory analysis program. (Lowry-Texas) W72-12069

MERCURY POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS, Advanced Technology Center, Inc., Dallas, Tex. J. D. Suggs, D. H. Petersen, and J. B.

Middlebrook, Jr.
Copy available from GPO Sup Doc EPA 16080
HTD 03/72, \$0.50; microfiche from NTIS as PB-211 250, 80.95; paper copy \$2.50. Environmental Protection Agency, Water Pollution Control Research Series, March 1972. 38 p, 4 fig, 4 tab, 7 ref. EPA Program 16080 HTD 03/72.

Descriptors: *Mercury, *Toxicity, *Sorption, Deposition (Sedimentation), Sulfur, Separation techniques, Solubility, Sediments, Dissolved oxygen, Water quality control, Hydrogen ion con-Identifiers: *Mercury pollution control.

Organic fractions in sediments exhibit a strong tendency to sorb inorganic mercury resulting in lo-calized deposition near the contamination source. High concentrations of mercury do not exist in natural waters until the underlying sediments have reached their sorption limits or until soluble organic forms have been generated. Mercury getters based on elemental sulfur and thio-organic compounds dispersed in recoverable matrices are capable of removing mercury from both the water column and underlying sediments. Elemental sul-fur deployed as a coated meshwork was the most effective means of recovering inorganic mercury. The gettering action occurs over a period of months with no apparent degradation in water quality. Furthermore, the presence of elemental sulfur retards biological methylation of mercury. Long-term evaluation of mercury getter systems indicates that pH and dissolved oxygen are impor-tant only to the extent that they affect the concen-tration of desorbed mercury in the vicinity of the getter. (Lowry-Texas) W72-12070 RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 05D. W72-12071

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CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT, Robert S. Kerr Water Research Center, Ada,

Robert S. Kerr Water Research Center, Ada, Okla. W. R. Duffer, and C. C. Harlin, Jr. Copy available from GPO Sup Doc EPA 16080 GGH 08/71, \$1.25; microfiche from NTIS as PB-211 159, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 110 p, 32 fig, 9 tab, 16 ref. EPA Program 16080 GGH 08/71.

Descriptors: *Reservoirs, *Pre-impoundment, *Post-impoundment, *Water analysis, Dissolved oxygen, Thermal stratification, Nutrients, Biochemical oxygen demand, Aquatic life, Sewage effluents, Decomposing organic matter, Statistical methods, Water balance, Water quality control, Oklahoma.

Identifiers: *Arbuckle reservoir, Rock Creek, Oxidation metabolism, Hypolimnetic oxygen deficit.

changes in stream water quality, resulting from recent impoundment, are presented and discussed. Extensive data reflecting pre- and post-impoundment conditions were statistically analyzed. The extent to which pollutants influence changes in water quality was minimal, since the drainage basin was relatively undisturbed by the activities of man. Chemical, physical, and microbiological parameters at stream stations were evaluated for three discrete periods of time: prior to closure of the dam, during filling of the active conservation pool, and following filling with the surface maintained near the top of the active conservation elevation. Effects of removing treated municipal waste effluents from a tributary were also evaluated. Water quality changes within the impoundment were compared with respect to season, year, station location, and depth of sampling. Critical factors in the impoundment, which contributed to water quality changes, are identified. (Lowry-Texas) W72-12072

PNEUMATIC BARRIER AND BEACH POLLU-

TION, AMF Technical Center, Stamford, Conn. M. S. Hertzendorf, J. V. Fiore, H. E. Klei, and I.

M. S. Hetterbury, S. L. Kopelman.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA2, p 379-396, April 1972. 10 fig, 5 tab, 10 ref. FWPCA Grant No. WDP-229-01-68.

Descriptors: *Sanitary engineering, *Beaches, *Recreation facilities, *Pollution abatement, *Water quality control, *Barriers, *Chlorination, *Aeration, *Bacteria, Coliforms, Dissolved oxygen, Organic compounds. Identifiers: *Pneumatic barriers.

Pneumatic barriers, both with and without chlorination, for improving the sanitary conditions of certain beaches were studied by an experimental system consisting of four parallel lines (three air and one water chlorination) covering approximately 355 ft. of beach under a mean tidal value of 72 ft., a complete cycle of about 12 hrs. 15 min. and a net water exchange of 1,600,000 gal. Air was supplied by two 100 standard cut //min compressors and was sparged through 1/64 in. or 1/32 in. openings, spaced at 30 in. intervals at conditions assuring critical velocity across these openings. Aeration proved to have no statistically significant effect in lowering bacterial levels. Chlorination did effectively reduce all bacteria levels in the basin and pneumatic curtains were effective in containing surface debris and oil. (Ensign-PAI)

W72-12076

SEPARATION MECHANISM OF MITSUBISHI OIL-WATER SEPARATOR, Mitsubishi Heavy Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst. K. Katsuta. Mitsubishi Heavy Industries Technical Review, Vol. 8, No. 3, p 70-75, 1971. 12 fig.

Descriptors: *Oil pollution, *Separation techniques, *Flow separation, *Fluid mechanics, *Coalescence, Drops (Fluids), Tubes, Equations, Water quality control. Identifiers: *Japan, Mitsubishi Oil-Water Separa-

The Mitsubishi oil-water separator is described. The critical diameter of oil particle can be separated from water in a small tube under laminar flow. Smaller oil particles can be separated by the collision with larger particles in a small tube. Oil separated on the wall of the tube gradually rises along the tube wall to the top, where it is condensed into oil film. When the thin film reaches the end of the tube it becomes a large oil drop and floats up immediately. The drop is 100-300 times as large as the oil particle at the inlet of the separator. (Ensign-PAI)

A STUDY OF THE EFFECTS OF A COMMER-CIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE

AREAS, Florida Dept. of Natural Resources, St. Peter-sburg, Marine Research Lab. For primary bibliographic entry see Field 05C. W72-12083

GENERAL THEORY OF SELF-PURIFICATION IN THE SEA, (THEORIE GENERALE DE L'AU-TO-EPURATION DE LA MER),. Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).

Revue International D'Oceanographie Medicale, Vol. 24, p 61-125, 1971. 1 fig, 6 tab, 92 ref. Article in French.

Descriptors: *Self-purification, *Marine bacteria, *Pollution abatement, *Estuaries, *Hypolimnion, *Sediments, Bacteria, Sedimentation, Precipita-

Identifiers: *Pelagic environment, Predatory activity, *Chemical secretions, Protozoa, Metazoa, Superior algae, Cyanophycea.

Self-purification and its importance in the bacterial pollution phenomena in ocean waters are analyzed. A specificity of actions in the estuarine, benthic and pelagic environments is detailed. Self-purification in the estuarine environment, such as sedimentation, precipitation and the predatory activity of micro-organisms, has only a mild impact against the great numbers of pollutant organisms. In the benthic environment, as in estuaries, protozoa's and metazoa's predatory roles promote purification. Also the indirect activity of organisms discharging various chemical substances through active and passive secretions was found to be purifying. In sediments these biochemical mediators are marine bacteria, in the aquatic benthic environment superior algae and mediators are marine bacteria, in the aquatic benthic environment superior algae and cyanophycea play this role. These secretions dif-fuse into the whole of marine waters. In the pelagic environment the predatory phenomenon is quite negligible against such an enormous phytoplanktonic biomass. The secretions do, how-ever, confer an important antibiotic influence in sea water during long periods of the year. The self-purification phenomenon based on the specificity of mechanisms by marine organisms antagonistic of mechanisms by marine organisms antagonistic to terrestrial bacteria constitutes the basic element of stability or biological equilibrium necessary for a healthy marine environment. (Ensign-PAI)

W72-12095

FLOATING OIL BARRIER, Sawyer-Tower Products, Inc. Watertown, Mass. W. A. Reilly. U.S. Patent No. 3,548, 599, 2 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1348, December 22, 1970.

Descriptors: "Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Equipment, Separation techniques, *Water pollution treat-ment, Leakage.

This oil spill barrier comprises a semi-flexible buoyant section and a semi-flexible submerged stabilizing section. These hold the upper surface of an elongated trough-shaped deck above the normal water level. Liquid sloshing over one side of the barrier into the trough can be drained out of one or both ends of the trough. An array of such barriers may be used to surround the source of oil leakage. (Sinha-OEIS)

STAGED OXYGENATION OF BOD-CONTAI-NING WATER, Union Carbide Corp., New York. For primary bibliographic entry see Field 05D. W72-12131

ABSORPTION OIL, SKIMMER, Standard Oil Co., Chicago, Ill. R. G. Will, and W. F. Swiss, Jr. U.S. Patent No. 3,546,112, 4 p, 3 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 704, December 8, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Separation techniques, *Hydrocarbons, Organic compounds, Water pollution control, Water pollution treatment, Equipment, *Absorption.

Identifiers: *Oil skimmers.

This invention provides for absorption of the oil layer and some of the water into an open pored resilient material. A mild compressive force is applied to the material to remove the water and a severe compressive force removes the oil. The apparatus comprises a drum mounted for rotation along its longitudinal axis on a mounting platform. The drum is covered with an open pored resilient plastic foam. As the drum rotates the liquids are picked up and subsequent compressive forces are applied to remove the water and the oil. (Sinha-OEIS) W72-12138

METHOD AND APPARATUS FOR NEUTRALIZ-ING ACID WASTE WATER, United States Steel Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 05D. W72-12147

METHOD OF AERATING STILL BODIES OF WATER, M. Mendelson

U. S. Patent No. 3,540,222, 3 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 798, November 17, 1970.

Descriptors: *Patents, *Aeration, Wave action, Buoys, *Stratification, Water pollution control. Identifiers: Stirring.

This device comprises a buoy floating on the surface of a stratified body of water. It is connected by cables to a stirring device suspended at a point between the bottom and top of the water. When wave action raises the buoy, the stirrer is moved upward inducing vertical flow. The stratification is disrupted and bottom water moves to the surface where it may be aerated. (Sinha-OEIS)

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

W72-12152

OIL COLLECTION BOOM,

U. S. Patent No. 3,539,013, 3 p, 5 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 487, November 10, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Water pol-lution treatment, Separation techniques, Equip-Identifiers: *Oil booms.

The oil collection boom comprises a porous elongated tubular net sleeve and thin flat elongated bats of compressible buoyant, oil sorbent material inside the length of the sleeve. The bats are formed of a randomly oriented mass of polymer fibers. The boom can be conveniently deployed in the path of an oil slick. Most or all of the oil is col-lected upon the fibrous surfaces inside the bat and very little oil escapes beyond the structure. (Sinha-OEIS) W72-12154

MEANS FOR COLLECTING FLOTSAM.

A. F. A. Pearson.

U. S. Patent No. 3,539,048, 3 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 496, November 10, 1970.

Descriptors: *Patents, Harbors, Ports, *Flotsam, *Domestic wastes, *Municipal wastes, Pollution abatement, Equipment, Water pollution control, Water pollution treatment, Treatment,

A single or twin hulled vessel (ship) is used for collecting floating domestic or municipal wastes from the surface of the water in harbors or ports. It has an endless conveyer which is arranged to project into the water. The conveyor has spikes arranged in any combination or pattern to pick up the solid floating debris. It lifts the debris into a collecting receptacle. The collecting receptacle may be a hold in the vessel itself, or if the vessel is twin hulled the receptacle may be a barge which can be nosed in between the two hulls. (Sinha-OEIS) W72-12155

FIRE EXTINGUISHING OIL SLICK SEPARA-

McRae Oil Corp., Houston, Tex.

B. G. Cornelius.

U. S. Patent No. 3,536,199, 6 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 879, No 4, p 1137, October 27, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Pollution abatement, Separation techniques, Water pollution control, Water pollution treatment.

This separator consists of a rotating drum floated on an oil slick on the water surface. The drum picks up the oil and carries it into a chamber to be scraped off and remain where combustion will not take place. The separator drum is held by mounting arms which have upper ends mounted on pivot pins on each side of the bow of the vessel. Axially aligned axle ends extend outward from the drum end closures and these are journaled in the lower ends of the mounting arms. (Sinha-OEIS) W72-12158

INACTIVATION VIRRIO OF PARAHAEMOLYTICUS IN DISTILLED

WATER, Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05C.
W72-12163

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR, Michigan State Univ., East Lansing. Dept. of

Economics. For primary bibliographic entry see Field 07C.

VERIFICATION ERROR IN SINGLE SAM-PLING INSPECTION PLANS FOR PLANS FOR PROCESSING SURVEY DATA, Bureau of the Census, Suitland, Md. Statistical

Research Div. For primary bibliographic entry see Field 07C. W72-12184

HIGH RATE FILTRATION OF COMBINED

SEWER OVERFLOWS, Hydrotechnic Corp., New York. For primary bibliographic entry see Field 05D. W72-12191

MANAGEMENT MODELS, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 06A.

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES, Illinois University, Urbana. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 06A. W72-12234

ECOCIDE AND THOUGHTS TOWARD SUR-VIVAL.

For primary bibliographic entry see Field 06G. W72-12261

SAFETY CONSIDERATIONS FOR DETER-

Proctor Gamble Co., Cincinnati, Ohio. Miami Vallev Labs.

Preprint, presented at 6th International Water Pol-

lution Research Conf., Session 6, Hall A, Paper No 11, June 20, 1972. p A/6/11/1-A/6/11/8. Descriptors: *Environmental effects, *Safety, *Detergents, *Biodegradation, Alkylbenzene sulfonates, Chemical properties, Laboratory tests, Toxicity, Activated sludge, Trickling filter, Efficiencies, Performance, Heavy metals, Chelation, *Water nuglity control."

"Water quality control.

Identifiers: "NTA, "Nitrilotriacetic acid, Pharmacology, Consumer testing, Treatability, Concentration levels.

Procedures involved in the investigation of environmental safety of new substances or formulations proposed for new products were described. The case history of NTA in detergents was presented. Testing procedures have not been the same for each product, but as a minimum each of the following has been considered: chemical properties, pharmacology, toxicology, consumer testing, biodegradability, environmental toxicity, treatability and projection of concentration levels. NTA, the trisodium salt of nitrilotriacetic acid, added at levels of 5-50 mg/l to unacclimated river water was degraded after 8-12 days, when added to water previously acclimated, degradation times ranged from 2-6 days. Both activated sludge and trickling filter units, once acclimated, consistently gave greater than 90% removal of NTA from incoming sewage. Most NTA-heavy metal chelates were degraded as rapidly as NTA itself. If NTA replaced phosphate in all detergent products, its projected level in receiving waters would average no more than 25 ppb. Also, the history of alkyl-benzene sulfonates (ABS), illustrating some of the broader points of safety testing was presented. (Galwardi-Texas) W72-12290

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LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY.

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from the National Technical Information Service as PB-211 247, \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Scientific Information Center Report, WRSIC 72-206, May

Descriptors: *Delaware, *Maryland, *Virgin *Bibliographies, *Abstracts, Legal aspects, Water pollution, River basins, Administrative agencies, Federal government, Water pollution control, In-formation retrieval, Publications.

The bibliography is a compilation of selected water resources abstracts on the legal aspects of water pollution in Delaware, Maryland and Virginia. A series of 84 selected abstracts is included from a data base of 37,916 abstracts. A separate list of significant weighted descriptors and identifiers used to index the abstracts is printed, along with a comprehensive list of all descriptors and identifiers contained in the abstracts. (Grant-Florida) W72-12297

POLLUTION OF THE SEAS BY CRUDE OIL-A PROPOSAL FOR EFFECTIVE REMEDIAL AC-TION, R. A. Marks.

Ohio State Law Journal, Vol 33, p 80-101, 1972.

Descriptors: *Oil pollution, *Oily water, *Remedies, *Washington, *Federal government, Descriptors: Legislation, Water pollution sources, Water management (Applied), Water pollution effects, International waters, United States, Oil industry, Water pollution, Water pollution treatment, Abatement, Comprehensive planning.

This discussion is limited to pollution of the seas by crude oil and considers a proposal for the prevention and cleanup of further pollution. The sources, effects, and future of oil pollution are considered. The sources include maritime carriage of oil, off-shore drilling operations, intentional dumping of oil, and oil rising from cracks in the ocean floor which are created by man and by natural seismatic activity. The most serious con-sequence of oil pollution on the environment is the destruction of aquatic life. The international response to oil pollution, which includes the Inter-national Convention for the Prevention of Pollution of the Sea by Oil in 1954, the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casulaties, the International Convention on Civil Liability for Oil Pollution Damage, and the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollu-tion is examined. The United States response to this problem and the example set by the State of ington in imposing a strict liability standard for pollution of its waters by oil are described. Proposals are suggested in terms of prevention, cleanup, and liability for damages. (Widman-Florida) W72-12300

THE REFUSE ACT OF 1899: KEY TO CLEAN

For primary bibliographic entry see Field 06E. W72-12301

Water Quality Control—Group 5G

ENVIRONMENTAL LAW-THE REFUSE ACT, D. J. Millstone. West Virginia Law Review, Vol. 73, p. 267-282,

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Descriptors: "Rivers and Harbors Act, "Water-courses (Legal aspects), "Navigable waters, "Pollution abatement, Water pollution control, Legal aspects, Water law, Legislation, Judicial decisions, Regulation, Industrial wastes, Solid wastes, Waste disposal, Water pollution, Water pollution sources, Federal government, Water resources, Law enforcement, Federal Water Pollution Act, Sewage effluents, Permits. Identifiers: "Refuse Act.

Discharging refuse matter into navigable waters, or into any tributary of navigable waters, or into any tributary of navigable waters, or situtes a violation of the Refuse Act. An exception to this prohibition is the discharge of refuse flowing in a liquid state from streets and sewers. The responsibility for enforcement of the Act is vested in the Army Corps of Engineers, who also have the authority to issue permits for discharges. There is a federal interest in protecting tributaries of navigable waters from pollution. Even though waters flow indirectly into navigable waters, they are within the scope of regulation of the Refuse Act. In at least one case it was contended that the Federal Water Pollution Act suspended pollution control measures under the Rivers and Harbors Act. Looking to express provisions of the Water Pollution Act the courts would be compelled to find that the Act does not supersede or supplant the Refuse Act. The Refuse Act may be made sterile by a limited definition of the term 'tributary', but with a liberal definition of this term the white may be offered an excellent source of prory', but with a liberal definition of this term the public may be offered an excellent source of pro-tection. (Brackins-Florida) W72-12302

EXPANSION OF THE ALASKA WATER LABORATORY, Congress, Washington, D.C.; and House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12303

JACKLOVICH V. INTERLAKE, INC. (QUI TAM ACTION MAY NOT BE MAINTAINED UNDER RIVERS AND HARBORS ACT). For primary bibliographic entry see Field 06E. W72-12306

AN ACT....RELATING TO WATER POLLU-TION CONTROL, WATER SUPPLY AND SEWER SEPARATION PLANNING ASSISTANCE AND GRANTS. For primary bibliographic entry see Field 06E. W72-12309

ENVIRONMENTAL PROTECTION ACT OF 1971. For primary bibliographic entry see Field 06E. W72-12310

WATERS--PERMITS FOR NEW DISCHARGES. For primary bibliographic entry see Field 06E. W72-12311

WATER POLLUTION CONTROL-TREATED SUBSTANCES-DISCHARGE. For primary bibliographic entry see Field 06E. W72-12312

WATER POLLUTION CONTROL-PERMITS FOR NEW DISCHARGES-HEARING. For primary bibliographic entry see Field 06E. W72-12313

CONSITTUTIONAL LAW-FEDERAL PREEMPTION OF STATE REGULATORY AUTHORITYFEDERAL GOVERNMENT HAS SOLE
AUTHORITY UNDER ATOMIC ENERGY ACT
TO REGULATE RADIOACTIVE WASTES
DISCHARGED FROM NUCLEAR POWER
PLANTS-NORTHERN STATES POWER CO. V.
MINNESOTA,
A. N. Elgart,
Boston College Industrial and Commercial Law
Review, Vol. 13, p. 813-826, 1972. 83 ref.

Descriptors: *Federal jurisdiction, *State jurisdiction, *Nuclear powerplants, *Federal-state water rights conflicts, Judicial decisions, Discharge (Water), Environmental effects, Federal government, Nuclear energy, Water pollution sources, Legal review, Water law, Legal aspects, Jurisdiction, Governmental interrelations.

tion, Governmental interrelations.

In 1967 the Atomic Energy Commission (AEC) issued plaintiff Northern State Power Company, a Minnesota corporation, a construction permit to build a nuclear-fueled electric power plant in Minnesota. Defendant state and Minnesota Pollution Control Agency subsequently issued plaintiff a permit requiring radioactive discharges to comply with state standards which were more restrictive than those of the AEC. Plaintiff sought a judgment declaring defendant to lack the authority to regulate discharges of radioactive wastes because this field of regulation had been preempted by the federal government under the Atomic Energy Act. The federal district court found for plaintiff and the court of appeals affirmed, holding that the United States has sole authority under the Atomic Energy Act to regulate the construction and operation of nuclear power plants, and this authority necessarily includes regulation of the levels of radioactive effluents discharged from the plant. This case note first examines the doctrine of preemption and the various factors which establish congressional intent to preempt a field of regulation. The instant holding is discussed in relation to state police powers to control pollution. The dissenting opinion is examined. An amendment to the Atomic Energy Act expressly declaring that radioactive discharge standards are within the exclusive jurisdiction of the AEC is needed. (Widman-Florida)

JUDICIAL RECOGNITION OF THE SUBSTAN-TIVE REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, B. S. Cohen, and J. M. Warren. Boston College Industrial and Commercial Law Review, Vol. 13, p. 685-704, 1972. 73 ref, append.

Descriptors: *Federal project policy, *Legal review, *Administrative agencies, *Decision making, Administrative decision, Legal aspects, Legislation, Federal government, Projects, Project planning, Regulation, Environmental effects, Administration, Judicial decisions.

Identifiers: *National Environmental Policy Act.

In litigation based on the National Environmental Policy Act the broadest limits to which the courts have been willing to construe the Act has been to hold that the procedural requirements were to be strictly applied, but they have declined to hold that the substantive provisions were to be similarly enforced. By evaluating only compliance with procedural requirements of NEPA, the courts, in effect, make the agency the final arbiter of administrative compliance with the substantive provisions of the Act. The courts have ignored the fact that the procedural and substantive provisions of the Act are conjunctive and intended to have equal applicability. The procedural requirements incorporate the substantive policy and goals of NEPA, thereby imposing an affirmative duty on all federal agencies to protect the environment by avoiding adverse environmental effects to the fullest extent possible. The failure of the courts to require compliance with the substantive require-

ments will lead to frustration of the legislative pur-pose of NEPA. (Brackins-Florida) W72-12316

A STRUCTURAL MODEL FOR A WORLD EN-VIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE, For primary bibliographic entry see Field 06G. W72-12317

THE POLLUTION FIGHT BEFORE THE U.S. COURTS, Michigan Univ., Ann Arbor. School of Law. For primary bibliographic entry see Field 06E. W72-12320

WATER POLLUTION, American Univ., Washington, D.C. H. Lieber. Current History, Vol 59, p 23-30, 50-52, July 1970.

Descriptors: "Environmental control, "Water pol-lution, "Legislation, "Federal government, "Water pollution control, Social aspects, Adoption of practices, Water pollution sources, Water policy, Water pollution effects, Water quality, Water management (Applied), Programs, Pollutants, Pol-lution abatement, Pollutant identification.

Water pollution is at the root of an endless list of problems which are varied, complex, and not easily given to simple or uniform solutions. Present day problems can be classified under the following catagories of pollutants: organic or oxygen-demanding wastes, infectious agents, plant nutrients, synthetic organic chemicals, inorganic chemicals and mineral substances, sediment, radioactive substances, and heat. In practice most wastes are a mixture of these eight types of pollutants, which makes treatment and control difficult. The major sources of water pollution are manufacturing, domestic or municipal wastes, agricultural wastes, mine drainage, and navigation and recreation activities. Some emergency problem areas include lake eutrophication, estuarine destruction, ocean pollution, environmental effects of power generation, and health effects of new chemicals. Federal legislation and programs to cope with these ion, and health effects of new chemicals. Federal legislation and programs to cope with these problems are examined. A discussion is included of recent developments in the area such as the National Environmental Policy Act of 1969, future trends and suggestions such as reuse and recycling of wastes, and governmental trends such as economic incentives to encourage pollution control and the environmental ombudsman concept. (Widman-Florida) W72-12321

THE FEDERAL GOVERNMENT AND THE EN-VIRONMENT, Senate, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12322

FROM POLLUTION ABATEMENT TO QUALI-TY CONTROL, Senate, Washington, D.C. E. S. Muskie.

Current, Vol 117, p 10-13, April 1970.

Descriptors: "Federal government, "Governmental interrelations, "Pollution abatement, "Quality control, Administrative decisions, Comprehensive planning, Adoption of practices, Coordination, Administration, Planning, Regulation, Governments, Institutional constraints, Decision making, Legislation, Conservation, Social aspects, Abatement.

Pollution is the special product of any society that places the consumption of goods and services high

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

on its scale of values, and which has the means to provide them in abundance. While some progress has been made in the areas of water quality standards, atmospheric contamination, and solid waste control, these are only the first stages of environmental protection. The next stage will involve the more subtle and pervasive questions of land and resource use, hazardous substances, population distribution and industrial location, noise and aesthetic pollution, ecological balance, and urban design. While there has been considerable federal effort, including the National Environmental Pol-icy Act of 1969 and the Water Quality Improvement Act of 1969, the proliferation of activities and overlapping responsibilities is becoming in-creasingly intolerable. The creation of an independent watchdog agency is proposed to exercise the regulatory functions associated with environmental protection. This agency would be charged with responsibility for developing and implementing federal environmental quality standards, support-ing basic research, stimulating investigation of control techniques, and providing technical assistance to state, interstate, and local operations. (Widman-Florida) W72-12323

UNITED STATES AND U.S.S.R. TABLE REVISED DRAFT TREATY BANNING EMPLACEMENT OF NUCLEAR WEAPONS ON THE SEABED, For primary bibliographic entry see Field 06E.

W72-12324

GULF OIL CORP. V. TUG GULF EXPLORER (DUTY OF SUBMARINE PIPELINE OWNER TO AVOID RUPTURES).

For primary bibliographic entry see Field 06E. W72-12326

ORAL PROCEEDINGS-APPROACHES TO OIL POLLUTION RESPONSIBILITY (PACEM IN MARIBUS CONVOCATION AT VALLETTA,

MALTA--1971). Oregon Law Review, Vol 50, p 587-598, Spring

Descriptors: *Ships, *Oil spills, *Law enforcement, *Waste water disposal, *Penalties (Legal), Treatment facilities, Oil pollution, Oceans, Water pollution treatment, Water pollution sources, Oil, Oily water, Oil wastes, Federal Water Pollution Control Act, Water pollution, Harbors, Oil Industry, Environmental effects.

Intentional oil spills from tankers have been increasing, and new legislation increasing fines for such spills has sought to reverse the trend. Enforcement of laws to stop the pumping of bilges into the sea has been difficult due to the fact that it is done at open sea and cannot be detected. Facilities at port for flushing these oil tanks has been deemed a solution; however, flushing facilities are either non-existent or inadequate. Thus shippers find it convenient to dump the oily water from their tanks into the sea. There is a grant to build a model plant to receive waste oily water from ships' tanks in an efficient manner. Also Oregon is considering a bill imposing a \$20,000 fine for inten-tional or negligent discharge of oil in state waters. Increasing fines is viewed as an effective way of dealing with this problem. Controlling foreign vessels with national legislation is more difficult. There have been proposals for treaties and inter-national agencies which have not yet been realized. The existing treaties are inadequate and bear the bias of the shipping interests. Future conventions on the matter will deal with liabilities for oil spills and construction and operation standards for tankers. (Ilkson-Florida)

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CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT), Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 08C. W72-12330

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08A. W72-12335

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

General Services Administration, Washington,

Available from the National Technical Informa-tion Service as PB-201 569D, \$3.00 in paper copy, \$0.95 in microfiche. August 5, 1971. 8 p, 1 map.

Descriptors: *Nuclear powerplants, *Environmental effects, *Groundwater, *Water supply development, Surface waters, Subsurface waters surface water availability, Multiple-purpose reservoirs, Federal government, Reservoir storage, Administrative agencies, Land use, Wildlife conservation, Water resources development, Texas, Recreation facilities.

Identifiers: *Environmental Impact Statements, *Amarillo (Tex).

With the closing of Amarillo Air Force Base in 1968, sewage flow was greatly reduced as were storage requirements. The Atomic Energy Commission determined that there was no requirement for the Pantex Lake Area and the land was declared excess to the needs of that agency. The proposed disposal action involves a negotiated sale of the entire fee estate to Carson County, Texas, for development of possible subsurface water underlying the land and develop-ment of the surface for parks and wildlife refuge. Water in Carson County is in short supply except from subsurface sources. These sources sidered naturally nonreplenishable and therefore withdrawal of this water could be an irreversible and irretrievable commitment of a natural resource. However, the withdrawal of this water will not create a deleterious effect on the environment and will not similar to similar the similar to ment and will not significantly affect the use of the surface for a wildlife refuge and park. Alternatives include conveyance of portions of the land to Texas Technological University and the local school district or to offer the land for sale by sealed bids. (Waldron-Florida) W72-12338

TOO MANY PEOPLE ON THE COLORADO RIVER, Arizona Daily Star, Tucson.

The Environmental Journal, National Parks and Conservation Magazine, Vol 45, No. 11, p 10-14, November 1971. 6 fig.

Descriptors: *National parks, *Colorado River, *Recreation wastes, *Boating, Sewage, Cruises, Economic impact, Reasonable use, Public health, Recreation demand, Reservoirs, Social aspects, Scenery, Use rates. Identifiers: *Wilderness.

In the last 7 years since the Glen Canyon dam gates were closed and the Lake Powell reservoir began rising, the river running season on the Colorado River through the Grand Canyon has in creased from 4 to 8 months. During 1969, more than 6,000 people floated down the river, and in

1970 this number increased to 10,072. More that 93% were carried by commercial outfitters. This heavy increase in use has resulted in degradation ollution in the canyon. These have form of oil, gas motor noise pollution, littering, health and sanitation problems, and damage to vegetation, wildlife, historic sites and prehistoric shrines. The sanitation problem became so bad that the Park Service installed pit toilets in the wil-derness area. Faced with the alternative solutions of shutting down all river running or carrying out trash, the Park Service chose the latter course. The preliminary Grand Canyon master plan proposes wilderness classification for all parts of proposes widerness classification for all parts of the canyon except the river. Commercialized boat trips will still be possible and motorized boats will continue to ply the river. The critical question con-cerning both this region and all wild areas is: should administrators have the goal of ensuring environmental preservation or should recreational values prevail. (Casey-Arizona) W72-12349 TH AS Wa Cal G. In: Sta ID

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06. WATER RESOURCES PLANNING

6A. Techniques of Planning

BALANCED UTILIZATION OF GROUND-

WATER RESOURCES, Layne-Western Co., Kansas City, Mo. For primary bibliographic entry see Field 04B.

THE RIVER BASIN MODEL: ASSESSMENT DE-PARTMENT.

Envirometrics, Inc., Washington, D.C. For primary bibliographic entry see Field 04A. W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT.

Envirometrics, Inc., Washington, D.C. For primary bibliographic entry see Field 04A. W72-12123

THE RIVER BASIN MODEL: THE TRANSPOR-TATION SECTIOR.

Envirometrics, Inc., Washington, D.C. For primary bibliographic entry see Field 04A. W72-12124

THE URBAN SYSTEM. Martin Marietta Co., Denver, Colo. R. E. Paulsen.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 10-32 (Chapter IB). 5 fig, 1 tab, 19 ref.

Descriptors: *Systems analysis, *Model studies, *Cities, *Urban hydrology, Financing, Transpor-

The city is a complex system which we still poorly understand. To the compelling problems of fragmentation and finances, there is a long list headed by transportation, housing, services, racial problems and the poor. To cope with such problems the government structure needs major improvement. A metro agency such as the Metropolitan Regional Council of Governments might be the answer. We need more data, and need to spend more effort discovering the underlying that govern the urban processes. We need a combined attack by experimental and theoretical means on the basic problem of understanding how elements of the urban system interact. (See also W72-05102) (Campbell-Cornell)

Techniques of Planning—Group 6A

THE URBAN WATER SYSTEM-TECHNICAL

ASPECTS, Water Resources Engineers, Inc., Walnut Creek, Calif. G. T. Orlob.

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In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 48-63 (Chapter ID). 8 fig, 4 ref.

Descriptors: *Systems analysis, *Water resources, *Cities, *Model studies, *Urban hydrology, Planning.

This study considered system analysis applica-tions to problems of individual subsystems and to comprehensive analyses of all the connected urban water subsystems operating simultaneously. The urban water resources system is envisioned as comprising two major subsystem types: Location Subsystems and Transfer Subsystems. The major Subsystems and transier Subsystems. The major conclusion was that systems analysis did offer great potential for assisting planning, design, and operation of urban water systems. But paradoxically comprehensive modeling has to proceed from rather general descriptions of the urban water environment, whereas it is best to begin at the most detailed operational level. Hopefully a comprehensive and detailed model will be constructed, connecting the several kinds of models. (See also W72-06102) (Campbell-Cornell) W72-12222

THE URBAN WATER SYSTEM-ECONOMIC

ASPECTS, Water Resources Engineers, Inc., Walnut Creek, Calif. M. B. Sonnen.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 64-90 (Chapter IE). 19 fig, 3 ref.

Descriptors: *Systems analysis, *Model studies, Economics, *Costs, *Waste treatment, *Cities, *Urban hydrology, *Decision making, Planning, *Waste water treatment.

The objective of water planning has been to maxmize net benefits. This is not the same as maximizing the benefit-to-cost ratio from among a series of alternative water development plans.

Levels of possible decisions about water quality and economic objectives are discussed. Some and economic objectives are discussed. Some economic evaluation models built to analyze urban water economics problems on several of these levels are examined. Included are a least-cost water treatment model, a benefit-cost model for water treatment, waste treatment economics models, and comprehensive urban water economics models. (See also W72-06102) (Campbell Careal) bell-Cornell) W72-12223

THE SYSTEMS APPROACH,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Reid.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 181-187 (Chapter IIIA).

Descriptors: *Systems analysis, *Model studies, *Decision making, *Water control, *Operations

In search of some organizing principles that might provide a coherent approach to public problems for the next few decades, it is helpful to view the problem areas as aspects of a system. The system approach provides a look at the whole system rather than one part at a time, as has been done in the past. A model issued as a symbolic representation of a real life situation, investigating numerous the past. A model issued as a symbolic representa-tion of a real life situation, investigating numerous variables simultaneously. Problems can be ap-praised in terms of alternative decisions, and ranked in relation to other public action programs. Water problems can be looked at from several

levels: strategical, logistical, or tactical, or macro, micro, and micro-micro. Operations research is a method of investigation—not problem solving. The systems approach is a new way of looking at a problem. (See also W72-06102) (Campbell-Cornell) W72-12224

MANAGEMENT MODELS, Colorado State Univ., Fort Collins. D. A. Benton.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 188-207 (Chapter IIIB). 8 fig, 14 ref.

Descriptors: *Systems analysis, *Water quality, *Management, *Model studies, *Motivation, *Human resources.

When discussing water quality problems, people tend to forget the place of management and human resources models in urban water systems. The human element is a major part of systems theory and models. There are several models of motivation and organizational behavior: by Maslow, McGregor, Herzberg, Blake and Mouton, and Likert and Davis. They all show that management should be and probably is moving toward a more enlightened, more people-centered type of organizational behavior. The human individual deserves to be a major part of our models and systems. (See also W72-06102) (Campbell-Cornell)

MATHEMATICAL MODELING,

Geological Survey, Fort Collins. D. R. Dawdy.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 208-212 (Chapter IIIC).

Descriptors: *Systems analysis, *Mathematical models, *Optimization, *Model studies, *Planning.

An introduction to systems analysis, which is described as a state of mind and attitude, is presented. Mathematical modeling is one of the tools of systems analysis. Whereas mathematical programming is concerned with optimization, modeling describes a system. The two kinds of models are deterministic and stochastic. The latter is for a long-term prediction of a series of events, ans so is generally used for planning. Deterministic models are used in daily operation, and as a tool to predict what will happen as a result of a given action. (See also W72-06102) (Campbell-Cornell) W72-12226

OPTIMIZATION TECHNIQUES, Colorado State Univ., Fort Collins. Dept. of Civil

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 213-232 (Chapter IIID). 3 fig, 1 tab, 11 ref.

Descriptors: *System analysis, *Optimization, *Computers, *Model studies, *Analytical *Computers, techniques.

Identifiers: Sensitivity analysis.

Interest in mathematical optimization techniques has been largely motivated in the last 15 years by a host of new problems in technology, science, and economics. The advent of high speed computers has greatly broadened the scope and capability of optimization methods. The following methods of analysis are examined: production function or technologic efficiency; systems analysis and optimization: models as an optimization: timization; models as an optimization technique; analytic solutions or mathematical programming methods; and sensitivity analysis. Examples are given of each of these techniques. (See also W72-06102) (Campbell-Cornell) W72-12227

THE MACRO APPROACH-URBAN WATER DEMAND MODELS, Oklahoma Univ., Norman. School of Civil and Environmental Science. G. W. Reid.

G. W. Addi.
In: Treatise on Urban Water Systems, Colorado
State University Press, July 1971, p 235-294
(Chapter IVA). 5 fig, 5 tab, append.

Descriptors: *Water demand, *Forecasting, *Model studies, Economic analysis, Estimating, *Systems analysis, Alternative planning, Water

To study long range problems of the demand for water requires macro level, multistructural, multistaged, multivaried models, articulated over time toward consumer understandable objectives. The systems approach provides an ideal technique to have looks into the future, looks that are essential to the management for beneficial use of critical resources. Presented is a discussion of water demand estimating techniques. The demand models are described as consisting of population, an economic, a reconcilation, and life style model with definition of public service and private sector commitments. The demand can be expressed as the summary of municipal, industrial, and agricultural uses. The macro approach and use of the tural uses. The macro approach and use of the economic model leads the planner towards a series of goals both probable and possible. (See also W72-06102) (Bell-Cornell)

THE MICRO APPROACH—COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIRE-

Hittman Associates, Inc., Columbia, Md. J. J. Boland.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 295-316 (Chapter IVB). 9 fig, 6 ref.

Descriptors: "Water requirements, "Municipal water, "Forecasting, "Water supply, Estimating, Urban hydrology, Water users, "Model studies, Computer programs, Systems analysis.

The availability and quality of municipal water supply have had, over the years, a monumental effect on the nature of our development as an urbanicivilization. Primarily due to population growth, there is now a most critical need for the effective planning and management of water utilities. Although forecasting is a risky business, it is absolutely essential that forecasts be made in order Authough forecasting is a risky obusiness, it is absolutely essential that forecasts be made in order for a water supply system to meet its demand. Described is a research program which accomplishes: a review and evaluation of existing and possible techniques for estimating and forecasting municipal water supply demands; selection and merging of consistent techniques into a single comprehensive planning tool; and the development of a computer program to minimize the computational burden on the water supply planner. It is emphasized that the problem confronting most water supply planners is an intensely local one. It is suggested that the basic per capita approach to water planning, although generally successful when considering national or large-area forecasts, may not fully satisfy the requirements of the local water supply planner who is dependent upon precise accuracy, a necessity on the 'micro' level. The resulting convenient, reliable, and comprehensive method for forecasting municipal water supply requirements in urban areas is described in detail. (See also W72-06102) (Bell-Cornell) Cornell) W72-12229

APPLICATIONS OF LINEAR PROGRAMMING, OR LINEAR POTPOURRI, Colorado State Univ., Fort Collins. Dept. of Civil

Field 06—WATER RESOURCES PLANNING

Group 6A—Techniques of Planning

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 404-410

Descriptors: *Linear programming, *Mathematical models, *Systems analysis, *Planning, Optimum development plans, *Model studies.

Linear programming involves the planning of activities to obtain an optimal result which reaches the specified goal most efficiently (according to the mathematical model) among all feasible alternatives. There is a wide variety of problems which lend themselves to solution by linear programming. Some examples of these problems are presented and possible models for them are described. To name a few: Network-flow, activity analysis, and transportation problems. (See also W72-06102) (Bell-Cornell) W72-12230

LINEAR PROGRAMMING: GENERAL CON-

CEPTS AND METHODS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 411-431 (Chapter VIIB). 10 fig, 2 tab, 3 ref.

Descriptors: *Linear programming, *Algorithms, Mathematical models, Equations, *Model studies. Identifiers: *Slack variables, *Simplex method.

Presented is a detailed geometric interpretation of linear programming. Beginning with a simple problem involving only two decision variables, the role of the linear equation is explained. Further examined are convex sets and feasible region concepts, lines and polygonal convex sets, and linear programming equations. Presented also is a detailed algebraic interpretation of linear programming; the concept of slack variables and basic concepts of the simplex method are discussed. (See also W72-06102) (Bell-Cornell)

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND

Denver Board of Water Commissioners, Colo. N. Hobbs.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 442-477 (Chapter VIID). 5 fig, 6 tab.

Descriptors: *Linear programming, *Optimiza-tion, *Water demands, *Water supply, *Water management (Applied), *Water sources, *Water treatment, Model studies, Costs, Planning, Estimating, Systems analysis, Reservoirs, Constraints, *Colorado, Treatment facilities.

Identifiers: *Denver.

Denver, Colorado must gird itself to face the challenge of greater water use in future years. To insure optimum utilization of its present sources, planners are analyzing the techniques of linear programming to establish the future role of linear analysis in the operation of the Denver system. The case study reviewed deals with the furnishing of water from existing sources to existing treat ment plants to meet current demands, subject to the physical constraints of the water system. Provided is a description of these constraints and an introduction to two methods of approach (1) the linear programming analysis and (2) the network analysis. (See also W72-06102) (Bell-Cornell) W72-12232

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.

D. D. Meredith.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 599-625 (Chapter IXA). 4 fig, 3 tab, 31 ref.

Descriptors: *Mathematical models, *Dynamic programming, *Equations, *Algorithms, Stochastic processes, Optimization, Model stu-Identifiers: Probabilistic models, *Recursive equa-

An exposition is presented of the concepts and applications of the dynamic programming comp tional procedure for the reader who has had previous experience with this procedure. The concepts and procedures necessary for the application of the procedures, not rigorous proofs are discussed. Included is a list of 31 references for suggested reading and study to fill gaps in the material presented. A simple hypothetical example of a pipe distribution system is used to acquaint the reader with the details of a recursive equation and an algorithm. (See also W72-06102) (Bell-Cornell) W72-12233

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES, Illinois University, Urbana, Dept. of Civil En-

D. D. Meredith.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 626-652 (Chapter IXB). 4 fig, 5 tab, 12 ref.

Descriptors: *Dynamic programming, *Sewers, Costs, Hydraulics, Flow, Topography, *Systems analysis, Computers, Constraints, *Pipes.

Simplified problems are discussed to enable the student to learn the dynamic programming ap-proach, its limitations, its data requirements, and its usefulness in sewer studies. Many types of information are required to analyze a proposed sewer system, such as the cost of sewer pipes, the hydraulics of flow in sewers and the topography of the region; a sewer system layout must be derived. A functional diagram, the stages, the states, the decisions, returns and transformation functions, the incidence identities, the constraints, the recursive equation, a flow diagram, the computer program and the solution are presented for each problem and are recommended as necessary for the formulation and solving of dynamic pro-gramming problems. The emphasis is upon the dynamic programming technique and not the mechanics of sewer design and construction. (See also W72-06102) (Bell-Cornell) W72-12234

NONLINEAR PROGRAMMING AND SEN-SITIVITY ANALYSIS, Pennsylvania State Univ., University Park. Dept.

of Civil Engineering. T. M. Rachford.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 655-672 (Chapter XA). 9 fig, 6 ref.

Descriptors: *Algorithms, *Linear programming, *Mathematical models, Constraints, Optimization, Computers, Systems analysis.

Identifiers: *Nonlinear programming, Convexity, Concavity, Simplex algorithm, *Sensitivity analy-

Nonlinear programming is discussed in relation to linear programming, the nonlinear procedure of separable programming is examined in some detail, and the purpose, methods and types of sensitivity analysis are explained. Nonlinear programming is a logical extension of linear promming. The two techniques differ basically in gramming. The two techniques differ basically in the additivity property: increasing or decreasing returns to scale are not allowed in linear programming. The importance of the concept of convexity and concavity in nonlinear programming is discussed. Special attention must be given to the types of nonlinearities present in nonlinear pronming problems. There is no single proce for solving all nonlinear programming problems.

The success of a particular algorithm is closely related to the size of the problem, the density of the coefficient matrix, and the type of computer capability available. Advantages of the separable pro-gramming technique are that: (1) it permits the use of the Simplex algorithm for solution, and (2) it al-lows the use of data in the form in which it is often obtained. Sensitivity analysis is valuable as a tool to explore sensitivities that most strongly recommend linear and nonlinear programming; however, extensive sensitivity analysis is impractical without a digital computer. (See also W72-06102) W72-12235

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UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. J. C. Ward.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 673-693 (Chapter XB). 6 fig, 4 tab, 6 ref.

Descriptors: *Sanitary engineering, *Waste water treatment, *Kinetics, *Water purification, Operations research, Biological treatment, Chemicals, Physical properties, Flocculation, Disinfection, Chlorination, Fluoridation, Sedimentation, Aeration, Sewage treatment, Biochemical oxygen de-mand, Bacteria, Suspended solids, Mixing, Ad-sorption, Filtration. Identifiers: Unit operations.

Conventional unit operations of water treatment are discussed. The term 'unit operations,' as used by the sanitary engineer, refers to the physical, chemical, and biological phenomena occurring simultaneously in the unit operations of water purification and waste water treatment. A list of unit operations is presented. It contains: Mixing, Flocculation (physical), Solids transfer, Gas transfer (includes aeration), Ion transfer, Nutrient or molecular transfer, Disinfection (usually chlorination), Solids concentration and stabilization, Heat transfer, and others. Figures are presented showing: (1) a typical water treatment plant; (2) a conventional contact-stabilization activated sludge waste water treatment plant; (3) a typical trickling filter waste water treatment plant; (4) typical stabilization (photosynthetic) or mechanically aerated pond waste water treatment plant; and (5) a proposed physiochemical waste water treatment plant. Discussed are the kinetics of water purification and waste water treatment. (See also W72-06102) (Bell-Cornell) W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICA-TIONS TO PROCESS ANALYSIS AND CON-

Pennsylvania State Univ., University Park. Dept. of Civil Engineering. T. M. Rachford.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 694-708 (Chapter XC). 5 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, Optimization, Economic analysis, Costs, Constraints, Operations research, Mathematical models, Biochemical oxygen demand, Suspended solids, *Treatment facilities, *Design. Identifiers: *Nonlinear programming, *Sensitivity

analysis, Convexity.

Nonlinear programming and sensitivity analysis are used to determine an economical, yet technically sound design for a hypothetical waste water treatment facility and to explore its sensitivity to changes in specifications and input prices. The objective is to minimize cost, subject to a constraint on BOD removal. Factors over which the planner on BOD removal. Factors over which the planner has no control are: the design flow; physical, chemical and biological characteristics of the raw sewage; available technology; and design specifications, in the form of stream or effluent standards. It is found that the objective function will be convex and thus compatible with the method of linear programming. Cost-effectiveness functions for each unit process are derived from two separate analyses: (1) relationships between process efficiency and the physical characteristics and operational pragmeters (detention times. and operational parameters (detention times, chemical dosages) of the unit processes are developed; (2) cost of each unit is related to these operational parameters and physical charac-teristics. A decision model is derived and the case requirements presented. The objective function composed of nonlinear cost-effectiveness func-tions for primary, secondary, and tertiary waste water treatment is linearized by piecewise approximation. The basic solution is presented and postoptimality, sensitivity analysis is performed. (See also W72-06102) (Bell-Cornell)

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SOCIAL PROCESSES IN WATER MANAGE-

MENT SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Sociology. E. C. Vlachos.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 722-739 (Chapter XIC). 3 fig.

Descriptors: *Environmental engineering, *Natural resources, *Water management (Applied), *Social aspects, *Water resources, Systems analysis, Mathematical models, Water demands, Urban hydrology, Human population, Planning, Water use, *Urbanization.

Identifiers: *Urban growth, External environment, Internal environment.

A new approach to environmental resource management is needed which must involve technological assessments and evaluations that include much broader constraints than have been required in the past. The interaction of four essential elements must be taken into account: Population, Environment, Technology, and Social organization. Technological options must be assessed as significant social matters and their future implications plotted as efficiently as possible. Presented is a detailed systematic sociological analysis of natural resources and an effort towards a generalized model exemplifying an attempt for an integration of the organizational aspects of water management systems. (See also W72-06102) (Bell-Cornell)

6B. Evaluation Process

SALINITY AND WATER USE. For primary bibliographic entry see Field 03C. W72-11755

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Gutteridge, Haskins and Davey, Melbourne (Aus-For primary bibliographic entry see Field 03C.

SALINITY AND WATER USE: FUTURE RESEARCH DIRECTIONS,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Soils. For primary bibliographic entry see Field 03C. W72-11772

THE HUMAN DIMENSIONS OF DAM SAFETY, Department of Fisheries and Forestry, Ottawa (Ontario).

Chaterjee, and A. K. Biswas. Water Power, Vol. 23, No. 12, Part I, p. 446-453, Dec 1971; Vol. 24, No. 1, Part II, p. 17-21, Jan 1972. 13 p, 3 tab, 62 ref.

Descriptors: *Dam failure, *Safety, *Dams, *Disasters, Insurance, Investigations, Project planning, Impact, Benefits, Legislation, Behavior, Economics, Responsibilities, Warning systems, Bibliographies, Costs, Social aspects, Damages, Education, Zoning, Dam design, Psychological

aspects.
Identifiers: Canada, Malpasset Dam (France),
Baldwin Hills Resvr (Calif), Vaiont Dam (Italy),

Dam safety has long been considered a technical subject, and the significance of the human aspect in the overall problem of dam disasters has seldom been recognized. Reasons for this past neglect are:

(1) lack of knowledge regarding quantification of associated benefits and costs; (2) reluctance and indifference at the various levels of government; (3) lack of proper investigation and assessment of past dam failures; (4) dearth of research to test, improve, and innovate methods of handling disaster problems; and (5) lack of community perception of the problems. Research is needed to aster problems; and (5) lack of community percep-tion of the problems. Research is needed to resolve some of these complexities. Studies of dam disasters indicate a great need for investiga-tion and regulation of the human aspects of dam safety, and the many potential benefits to be gained from such studies. Because the present state of the art cannot completely eliminate dam failures. the major objective suggested is to failures, the major objective suggested is to minimize potential failure losses by such measures as zoning, disaster warning systems, dam safety insurance, and legislative action. Dam safety is iminsurance, and legislative action. Dam safety is important to society as a whole; engineers responsible for the design of dams and associated structures should work closely with economists and behavioral scientists to alleviate the problem of dam safety. (USBR) W72-11790

BETTER TOOLS FOR WATER RESOURCES, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering. For primary bibliographic entry see Field 03B. W72-11891

CRITERIA FOR ANALYSIS OF INTERRE-GIONAL TRANSFERS OF WATER, Washington State Water Research Center, Pull-

E. R. Tinney.

Journal of the American Water Works Association, Vol 58, No 11, p 1369-1373, November 1966.

Descriptors: *Planning, *Evaluation, *Water resources development, *Methodology, *Water transfer, *Technology, *Project planning, *Water sources, Droughts, Political aspects, Economic efficiency, Obsolescence, Multiple-purpose projects, Optimum development plans, Regional analysis.

ysis.
Identifiers: British Columbia, Technologic obsolescence, Interregional transfers.

Six criteria are developed for analysis of interregional diversions. These include delimitation of the regions affected by incremental economic analysis, inclusion of only those regional units for which benefits and costs can be ascribed, use of

appropriate time frame in terms of obsolescence and growth of region of origin, examination of the full range of alternatives, and recognition of variation of supply and provision for droughts. Application of these six criteria to analysis of interregional transfers would probably show that most such schemes are not feasible. Two major needs, to be developed through research, will be required to make the appropriate analysis. These are (1) the date of technologic obsolescence, and (2) the technique for determining net socio-economic benefits. The challenge is to the researcher to give the planner these new tools. (Flack-AWWARF) W72-11897

NEW LOOK AT RESOURCES POLICY, Cornell Univ., Ithaca, N.Y. Coll. of Engineering. G. P. Fisher. Journal of the American Water Works Associa-tion, Vol 57, No 3, p 255-261, March 1965. 2 ref.

Descriptors: "Water resources, "Water policy, "Water shortage, "Water allocation (Policy), "Water pollution, "Water law, "Multiple purpose, "Water reuse, Water rights, Water quality, Competing uses, Recreation, Distribution, Pricing, Political aspects, Institutions. Identifiers: Public policy, Market place.

The United States is not confronted with a widespread water shortage but its water problems will increase in severity if present management and use continue. The problems relate to (1) supply and demand, (2) demand and cost, and (3) law and public policy. Wise management includes judicious allocation, definition of water rights, equitable pricing, more efficient distribution, mutiple-purpose storage, and, in particular, reuse. The market system in water should be encouraged and law institutions modified to allow the market to operate. The public must be led to a balanced to operate. The public must be led to a balanced concern for all aspects of the water problem. (Flack-AWWARF) W72-11900

DETERMINATION OF STREAM USE, Philadelphia Water Dept., Pa. For primary bibliographic entry see Field 05G. W72-11910

WATER SUPPLY ECONOMICS, TECHNOLO-

GY AND POLICY, RAND Corp., Santa Monica, Calif. J. C. De Haven.

Journal of the American Water Works Association, Vol 55, No 5, p 539-547, May 1963. 1 ref.

Descriptors: *Water supply, *Economics, *Water policy, *Water law, *Pricing, *Prices, *Water utilization, Competing uses, Hydrologic cycle, Political aspects, Transpiration, Benefits, Discriminatory pricing, Intangible benefits, Reasonable use, Beneficial use, Economic efficiency, California, New York, Water transfer. Identifiers: *Alternatives, *Misallocation, Market place, Subsidy, Allocation, Metropolitan Water District of Southern California, New York City, Los Angeles, Imperial Valley.

Efficient allocation of present water supplies and development of new sources require use of economic criteria to lead to more efficient uses. Case studies of New York City and Southern California water systems reveal gross misallocation, waste, discriminatory and subsidized pricing and defective water law. Low subsidized prica are charged irrigators with resulting waste and low economic crop production. Lack of metering and excessive leaks in New York City encourage waste and overbuilding. Overinvestment and premature investment are based on errors in fact or on faulty reasoning such as counting intangibles or secondary benefits. Water rights are not clearly defined, lack certainty and cannot be transferred Efficient allocation of present water supplies and

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

easily. State assumption of ownership of unappropriated water is justified. A major change rather than a marginal modification is in order. AWWARF) W72-11913

STATUS OF WATER RESOURCES USE, CON-TROL AND PLANNING IN THE UNITED

STATES, John Hopkins Univ., Baltimore, Md.

A. Wolman. Journal of the American Water Works Associa-tion, Vol 55, No. 10, p 1253-1272, October 1963. 1

Descriptors: *Water utilization, *Water resources development, *Research priorities, Water demand, Economics, Competing uses, Runoff, Hydrologic cycle, Precipitation, Arid lands, Streamflow, *Planning, Political aspects, Scientific personnel, Training, Optimum development plans, Systems analysis, Humid areas, Regulated flow, Colorado River Basin, Foreign countries, Climatic zones. Climatic zones.

Identifiers: *Basic research, *Research needs, Allocation, Basin planning, Senate Select Committee on Water Resources.

The more significant problems in water resources and the research that will contribute to understanding and use of this resource are identified. Water problems are regional and solutions must be found on a regional basis. Research needs vary recipiedly that the properties of the problems are research. gionally but some are common, including stream gionally but some are common, including stream forecasting, optimizing water systems, weather forecasting and physiological aspects of water quality. Shortage of water scientists is a strong deterrent to solving water problems. Specifying research is basically a problem of optimal alloca-tion of resource funds and talent. (Flack-AW-W72-11914

USE OF WATER IN ALABAMA, 1970, WITH

PROJECTIONS TO 2020, Geological Survey of Alabama, University. L. B. Peirce.

Alabama Geological Survey Information Series 42, 1972. 77 p, 8 fig, 9 tab, 30 ref, 3 append.

Descriptors: *Water utilization, *Water resources development, *Alabama, Water yield, Stream-flow, Groundwater, Reservoirs, Consumptive use, Municipal water, Industrial water, Hydroelectric

In 1970, withdrawal use of water for all purposes in Alabama averaged about 6,700 mgd --nearly 2,000 gallons per capita daily. Of the total withdrawal, 96% was surface water drawn from streams or reservoirs, and 4% was groundwater drawn from wells or springs. Thermoelectric powerplants were the largest withdrawers of water, accounting for 75% of total withdrawal. The remaining 25% was accounted for by self-supplied industry (16%), public water supply (7%), and rural use (2%). Public water systems served about 2,187,000 persons, or 63% of the State's population in 1970. Of those served, 65% were population in 1970. Of those served, 65% were supplied from surface-water sources and 35% from groundwater sources. The total flow of Alabama streams averages about 93,000 mgd. Present commitments against this dependable supply amount to about 46,000 mgd, which includes all consumptive uses plus the water requirements. ments for hydroelectric power generation. It is estimated that the remaining undeveloped surplus of 6,000 mgd, when allocated to consumptive use, would support water withdrawals at 10 times the present rate. (Knapp-USGS) W72-11979

WATERPOWER RESOURCES OF THE USSR, A. N. Voznesenskii, A. B. Abakyan, V. A. Bernshtein, and A. A. Beschinskii.

Available from NTIS, Springfield, Va 22151 as TT70-50069 Price \$9.00 paper copy. Israel Program for Scientific Translations, Jerusalem, 1971. 646 p. (TT70-50069). Originally published by Izatel'stvo 'Nauka, Moskva, 1967.).

Descriptors: *Hydrology, *Water resources, *Water resources development, *Hydroelectric power, *Hydroelectric plants, Reservoirs, Reservoirs voir sites, Reservoir construction, Reservoir operation, Rivers, River basins, River basin development, Potential water supply, Water utilization, Water management (Applied), Economics, Economic impact, Costs, Investment, Maps.
Identifiers: *USSR, *Waterpower, *Hydropower.

This two-part monograph provides a comprehen-sive and detailed study of the waterpower resources of the USSR and of the problems con-nected with their development. Part One (Chapers nected with their development. Part One (Chapers I-VII) deals with waterpower resources and their revaluation, including potential waterpower resources of the USSR, technically exploitable waterpower resources, economically effective waterpower resources, tidal energy as a potential power resource, and waterpower resource. power resource, and waterpower resources of the world. Part Two (Chapters VIII-XII) deals with utilization of waterpower resources, including ex-amination of basic technical and economic aspects of waterpower engineering, nature and charac-teristics of waterpower development, and economic importance of reservoirs. The concludeconomic importance of reservoirs. The conclud-ing chapter presents engineering and economic figures for hydropower plants in operation under construction, and in the design stage. The data can be used to assess the engineering and economic importance of potential river power for power generation. (Josefson-USGS) W72-12024

A PRELIMINARY SURVEY OF PUBLIC-R-ELATED AGENCIES IN HAWAII, Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 06E. W72-12100

AN APPRAISAL OF PLANS TO MEET THE FRESH WATER REQUIREMENTS OF THE MISSISSIPPI GULF COAST AREA, Mississippi State Univ., State College. Water

Resources Research Inst. D. C. Williams, Jr., C. P. Cartee, and M. H.

Malchow Available from the National Technical Informa-Available from the National Technical Information Service as PB-211 157, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, July 1972, 43 p. OWRR A-052-MISS (1).

Descriptors: *Water supply, *Planning, *Mississippi, *Gulf Coastal plain, *Water requirements, Administrative agencies, State governments, *Project planning, Institutional constraints.

The purpose was to inventory and assess the plans to meet the fresh water needs of the Mississippi Gulf Coast. Over 30 fresh water related plans and studies involving the three coastal counties (Jackson, Harrison, and Hancock) were identified through literature review and contacts with the various planning agencies and governmental units. Seventeen of the plans considered to be relevant were evaluated in terms of selected criteria, the results of which are presented in tabular form. These plans are also discussed by county, to give a picture of the planning for each county in the study area. There is overlapping and fragmentation of plans and planning agencies. Also, there is a divergence of opinions as to the adequacy of current water supply and recommendations to meet the fresh water needs. Recommended new facili-ties have not been built. This may be the result of a normal time lag between recommendations and authorization, or the action agencies may not feel

the urgency suggested in the reports and/or other factors. The findings suggest there is a gap between the 'planners' and the officials with the direct responsibility of providing fresh water to the various users. W72-12103

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COMMUNITY ORGANIZATION PROGRAMS AND RELATIONSHIPS IN WATERSHED DEVELOPMENT, Mississippi State Univ., State College. Water Resources Research Inst.

J. H. Peterson, and R. N. Friery.
Available from the National Technical Information Service as PB-211 152, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, 1972, 49 p, 19 tab, 7 ref, append. OWRR A-059-MISS (1).

Descriptors: *Planning, *Organizations, *Commity development, Water resources developmen *Mississippi, *Watershed management, *Commissions of the committee of

The study involved a watershed project in Northeast Mississippi where community organizations were the primary means for dissemination of watershed information. Investigation focused on the impact of this means of dissemination. Thirtynine major community organizations interested in water necessary. water resource development were identified in two counties and their leaders interviewed to detercounties and their leaders interviewed to deter-mine activities of the organizations related to water resources, degree of cooperation with other organizations, and knowledge and attitudes of leaders with respect to water resource develop-ment. Data were compared by type of organization (county seat, small town and rural) and by county-Findings included: a general absence of communi-ty organizations in rural areas; a low level of active cooperation by community organizations in water resource programs; a higher level of information programs, greater knowledge and more favorable attitudes associated with county seat than small town organizations, and small town than rural or-ganizations; higher levels of knowledge than participation in information programs in county organizations, with the reverse true for small town and rural organizations, a lower level of information programs in the county more distant from the center of the project. Alternative means of dis-semination especially aimed at rural landowners are needed.

SOCIAL PROCESSES IN WATER MANAGE-MENT SYSTEMS, Colorado State Univ., Fort Collins. Dept. of

Sociology. For primary bibliographic entry see Field 06A. W72-12238

SOME PROBLEMS OF WATER RESOURCE MANAGEMENT IN VIRGINIA: A PRELIMINA-RY EXAMINATION,

College of William and Mary, Williamsburg, Va. J. A. Miri.

William and Mary Law Review, Vol. 13, p. 388-423 (1971). 36 p, 2 tab, 112 ref.

Descriptors: *Virginia, *Water resources development, *Water policy, *Administrative agencies, Legislation, Legal review, Legal aspects, Social aspects, Political aspects, Political constraints, Institutional constraints, State jurisdiction, Regulation, Adoption of practices, Water management (Applied), Diversion, Alteration of flow, Impoundments, Reasonable use, Riparian rights, Decision making, Planning.

The existing legal and administrative machinery for water resource management in Virginia is ex-amined. The general availability of water in the

state is misleading because it is no guarantee that individual areas have enough water. Another problem is the financial difficulty of resource development. Riparian law is examined and the author shows its problems in relation to resource development: uncertainty of riparian rights, inap-plicability to inter-basin transfers, and unsuitabiliplicability to inter-basin transfers, and unsuitability to ground-water resources. Two problems with existing statutory law are the fragmentation of policy and resource management responsibilities. These are analysed in detail. The author discusses the state's need for regulation of water diversions. The state water control board does not have the authority to regulate all diversions and impoundments, and there is no central state decision-making mechanism for assessing overall water resource needs. Planning and development needs are discussed including: the need for a more affirmative approach, the need for a more assertive state role, regional authorities and service districts, and state intervention where local government does not act. The author feels a comprehenive study of water resource management in Virsion of the state of the sta sive study of water resource management in Virginia is needed to eliminate gaps in planning. (Grant-Florida)

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TOO MANY PEOPLE ON THE COLORADO

RIVER, Arizona Daily Star, Tucson. For primary bibliographic entry see Field 05G. W72-12349

AN INDEPENDENT STUDY COURSE IN WATER RESOURCES, Southern Illinois Univ., Carbondale. Dept. of Conservation and Outdoor Education.

For primary bibliographic entry see Field 09A. W72.1230

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FUTURE PLANNING OF WATER RESOURCES AT THE REGIONAL WATER DISTRICT LEVEL, Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 03D. W72-11884

DUAL WATER SYSTEMS, Black and Veatch, Kansas City, Mo. For primary bibliographic entry see Field 03D. W72-11904

6D. Water Demand

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION, Colorado Univ., Boulder. Dept. of Civil Engineer-

ing. J. E. Flack.

Journal of the American Water Works Association, Vol 59, No 11, p 1340-1350, November 1967. 2tab, 16 ref.

Descriptors: *Future planning (Projected), *Methodology, *Water rights, *Water transfer, *Appropriation, *Water allocation (Policy), *Competing uses, *Elasticity of demand, Return flow, Condemnation, Institutional constraints. Identifiers: Re-allocation, Reserved rights.

The scope of the U. S. water problem and how reallocation can solve shortage problems are discussed. Demand projections of various uses are analyzed and reallocation of presently used water to higher economic uses is shown to be economically competitive with developing new sources in areas of shortage. Valuation of water rights, en-

gineering studies, reserved rights and institutional contraints on water transfers are important problems that are of concern in re-allocation. (Flack-AWWARF) W72-11888

TOMORROW'S METHODS TO PROVIDE TOMORROW'S SERVICE, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 05G. W72-11894

RECREATIONAL USE OF WATERSHEDS-JOINT DISCUSSION, Washington Suburban Sanitary Commission, Hyattsville, Md.; Sport Fishing Inst., Washington, D. C.; Maryland State Dept. of Health, Baltimore; and Public Health Service, Washington, D.C. A. P. Brigham, R. H. Stroud, I. D. McKewen, and F. B. Tayler.

F. B. Taylor.

Journal of the American Water Works Association, Vol 58, No 10, p 1260-1274, October 1966. 21

Descriptors: *Recreation demand, Boating, Sport fishing, *Recreation facilities, Swimming, Water policy, *Lakes, *Multiple-purpose reservoirs, Water quality control, *Water supply, *Water pol-

lution.

Identifiers: Washington Suburban Sanitation
Commission, Outdoor Recreation Resources
Review Commission, San Diego, Fishing management, New York City, U.S.P.H.S. Drinking Water
Standards.

A joint discussion is presented of the operator's concervationists, and state health, and federal ofconcervationists, and state health, and federal officials view of recreation use of public water supply watersheds. Controlled recreation is stressed by the operator, fishing as a key to recreational use by the conservationist, public health as a requirement but concern for all human needs by the state health spokesman and concern with Drinking Water Standards by the U.S. Public Health Service. The American Water Works Association Statement of Policy on Recreational Use of Domestic Water Supply Reservoirs is recommended as a guide but each reservoir should be appraised on its own merits. Restricted recreation usage may generate a recreation clientele of its own. (Flack-AWWARF)

USE OF WATER IN ALABAMA, 1970, W PROJECTIONS TO 2020, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06B. W72-11979 USE OF WATER IN ALABAMA, 1970, WITH

THE MACRO APPROACH-URBAN WATER

DEMAND MODELS, Oklahoma Univ., Norman. School of Civil and En-vironmental Science. For primary bibliographic entry see Field 06A. W72-12228

THE MICRO APPROACH-COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIRE-

Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 06A. W72-12229

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND

SUPPLY, Denver Board of Water Commissioners, Colo. For primary bibliographic entry see Field 06A. W72-12232

6E. Water Law and Institutions

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT, Melbourne Univ., Parkville (Australia). For primary bibliographic entry see Field 03C. W72-11770

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT, Water Conservation and Irrigation Commission, Sydney (Australia). For primary bibliographic entry see Field 03C. W72-11771

PARTNERSHIP IN COMPREHENSIVE RIVER BASIN PLANNING, Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 04A. W72-11886

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION, Colorado Univ., Boulder. Dept. of Civil Engineer-

For primary bibliographic entry see Field 06D. W72-11888

NORTHEAST WATER CRISIS AND ITS SOLU-TION,
For primary bibliographic entry see Field 03D.
W72-11890

NEW LOOK AT RESOURCES POLICY, Comell Univ., Ithaca, N.Y. Coll. of Engineerin For primary bibliographic entry see Field 06B. W72-11900

DEVELOPMENT AND EFFECT OF THE DELAWARE RIVER BASIN COMPACT, New York City Board of Water Supply.

V. G. Terenzio. Journal of the American Water Works Association, Vol 54, No 12, p 1445-1456, December 1962. 8

Descriptors: "Delaware River, "Delaware River Basin Commission, "Interstate, "Water resources development, Water supply, Project planning, Judicial decisions, Interstate compacts, Interstate rivers, Interstate commissions, River basin commissions, Water law, New Jersey, Pennsylvania, Delaware, New York.
Identifiers: "Delaware River Basin Compact, Trenton, Philadelphia, New York City, Catskill Mountains, Supreme Court, Corps of Engineers, Council of State Governments, Comprehensive plan.

The Delaware River Basin has a population of 22 million in four states served by its water systems. New York City's dependence on the Basin has grown steadily and lacking permission of the bordering states to increase its dimensions it sought such rights through the U.S. Supreme Court. Under the impetus of Corps of Engineers studies of the Delaware Basin and the Council of State Governments, interstate cooperation was fostered and the Delaware River Basin Compact resulted. Congress approved the Compact with rather stringent federal controls. The compact commission is precluded from interfering with the rights granted New York City and New Jersey by the Supreme Court and is obligated to formulate and adopt a Comprehensive Plan for water management in the basin. (Flack-AWWARF)

A POSTSCRIPT TO CALVERT CLIFFS', For primary bibliographic entry see Field 05G.

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

W72-11938

CONTROLLING GREAT LAKES POLLUTION: A STUDY IN UNITED STATES-CANADIAN EN-VIRONMENTAL COOPERATION, Wisconsin Univ., Madison. School of Law. For primary bibliographic entry see Field 05G. W72-11939

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER-LEGISLATIVE REFORMS TO IMPROVE THE BALANCING PROCESS,

Atomic Energy Commission, Washington, D.C. J. T. Ramey, and M. G. Malsch. Notre Dame Lawyer, Vol. 47, p. 1139-1162, 1972.

Descriptors: *Federal government, *Electric powerplants, *Enviri972ffects, *Legislation, *Electric power demand, Governments, Electric power production, Administration, Legal aspects, Comprehensive planning, Coordination, Regulation, Decision making, Public rights, Administrative decisions, Sites, Powerplants.

The current nature of those regulatory processes involved in the siting, construction, and operation of electric power plants is described. Emphasis is placed on the regulatory processes at the federal level, and some proposed institutional reforms intended to facilitate the balancing process between the need for electrical energy and the need for environmental protection. The Interagency Power Plant Siting Study Group, the Administration's proposed Power Plant Siting Act of 1971, proposed amendments to the Federal Water Pollution Control Act, and the other legislative proposals in this area are discussed. Problem areas relating to power plant siting legislation include the elimination of regulatory asymmetry between different types of plants, impact on existing plants, federal coordination, role of states in the regulatory process and federal pre-emption, and administrative procedures to be followed by regulatory agencies in decision making. The essential elements of the Administration's proposal-long range planning, early public notice and hearings, pre-construction review and approval after public hearings, and expanded research and development—combined with increased flexibility in decision-making procedures could provide a workable solution. (Widman-Florida) W72-11940

INTERNATIONAL CONFERENCE ON OCEAN POLLITION.

Hearings-Subcomm. on Oceans and Atmosphere--Comm. on Commerce, U.S. Senate, October 18 and November 8, 1971. 126 p, 14 fig, 8 tab.

Descriptors: *Water pollution sources, *Oceanography, *Environmental effects, *Oceans, Nutrients, Water quality, Fertilizer, Continental shelf, Continental slope, Exploration, Exploitation, Oil wastes, Oil-water interfaces, Drilling, Mining, Mining engineering, Technology, Aquatic habitats, Ecology, Fisheries, Fishkill, Waterfowl, International law, Wastes.

Testimony is presented before the Senate Subcommittee on Oceans and Atmosphere concerning the extent of ocean pollution. Captain Jacques Cousteau testified concerning the pollution he had observed in the world's oceans and the effect on ocean life. In particular his testimony describes the elimination of certain species of animals on the California coast, and the need to suffer certain loss of comforts in life in order to reduce pollution. Testimony of others concerns the growth in ocean exploration and exploitation technology such as deep sea drilling and mining and advanced shipping techniques. The ocean study programs of NASA and the U.S. Navy are described. Testimony is also presented by Thor Heyerdahl concerning the extent and degree of surface pollution he has observed on his ocean crossings. Dr. Barry Commoner testified concerning the interrelation between modern technological advances which make life more enjoyable and the pollution which results therefrom, such as increased need for fuels and resulting air pollution. Included is a paper on the origins of the environmental crisis covering agricultural production, textiles, detergents, secondary effects of technological displacements, and packaging. (Grant-Florida) W72-11941

WATER POLLUTION-CONTROL OF NUTRIENTS-CLEANING AGENTS-WATER CONDITIONERS.

Minnesota Session Laws Ch. 896 (1971).

Descriptors: *Minnesota, *Detergents, *Water pollution control, *Legislation, Legal aspects, Administrative agencies, Adoption of practices, Phosphates, Nutrients, Penalties (Legal), Regulation, Public health, Water pollution abatement, Chemicals, Cleaning, Domestic wastes.

The Act is designed to encourage the Minnesota Pollution Control Agency to set standards limiting the amount of nutrients in various cleansing and water conditioning agents. The factors influencing the prohibitions are outlined. The Act prohibits the nufacture for sale or use in Minnesota or import into Minnesota for resale any cleansing agent or chemical water conditioner which contains a prescribed nutrient. The pollution control agency may make regulations to carryout the prohibition. The agency is given power to seize prohibited cleaning agents. A procedure for restoration of se-ized items is provided. The sale or possession with intent to sell a household detergent by a manufac-turer or retailer without a verified test result hav-ing been filed is prohibited. Retailers are required to post lists of phosphate content of detergents and presoaks. Violation of the Act is a misdemeanor, punishable by a fine of not more than \$5,000 for each offense. The court may also enjoin further violations of the Act. Procedural matters are provided for in the trial of actions. (Grant-Florida) W72-11942

CONSERVATION OF FISHERIES RESOURCES. N.C. Gen. Stat. secs. 113-229, 113-230 (Supp. 1971).

Descriptors: *North Carolina, *Permits, *Legislation, *Dredging, Excavation, Earthworks, Soil mechanics, Legal aspects, Administrative agencies, Adoption of practices, Estuaries, Fish conservation, Landfills, Aquatic animals, Wildlife habitats, Marshes, Land reclamation, Tidal marshes, Lakes, Navigable waters, Environmental effects, Riparian rights, Governmental interrelations, Law enforcement.

Before any excavation or filling project is begun in any estuarine waters, tidelands, marshlands, or state-owned lakes, the statute requires that the party desiring to undertake the project secure a permit from the North Carolina Department of Conservation and Development. A Corps of Engineers permit may also be required, but the Department of Conservation coordinates with the Corps. The permit application is circulated among appropriate agencies and it may be denied if: (1) the proposed action will adversely affect public water use, (2) there will be a significant adverse effect on riparian land, (3) there will be a significant adverse effect on public health and safety, (4) there will be a significant adverse effect on conservation of public water supplies, or (5) there will be a significant adverse effect on fish and wildlife. Review provisions are included where another agency objects to the action of the Department of Conservation. Enforcement by criminal and civil proceedings is provided. The act applies to all per-

sons, corporations and their employees in the state. The act does not affect a riparian landowner's right of ingress and egress to navigable waters. (Grant-Florida) W72-11943 WA DE Co

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HURRICANE FLOOD PROTECTION AND BEACH EROSION CONTROL PROJECT REVOLVING FUND. N.C. Gen. Stat. sec 143-215.62 (Supp. 1971).

Descriptors: "North Carolina, "Legislation, "Hurricanes, "Flood protection, "Beach erosion, Financing, Project planning, Economics, Local governments, Governmental interrelations, Water resources development, Legal aspects, Administrative agencies, Administration, Erosion control.

A Hurricane Flood Protection and Beach Erosion Control Project Revolving Fund is established under the North Carolina Board of Water and Air Resources to finance the local portion of the cost of hurricane flood protection and beach erosion control projects. The Board shall make advances to cities and counties for advance planning and engineering work necessary to promote the development, construction, or preservation of hurricane flood protection and beach erosion control projects; construction of such projects and rela costs such as right of way acquisition; and mair tenance of the projects. Such advances are subject to repayment. Prior to making any advances to local governments the Board shall advise the ment whether the projects would serve their intended purposes, whether there is a prospect of federal financing, and whether the anticipated financial outlays would constitute an unreasonable burden on the citizenry. No advance may be made without reasonable assurances that the project will be undertaken and the advances repaid. (Grant-Florida) repaid. (Gra W72-11944

REGIONAL SEWAGE DISPOSAL PLANNING ACT.

ACT. N.C. Gen. Stat. secs. 162A-26 thru 162A-30 (Supp. 1971)

Descriptors: *North Carolina, *Sewage disposal, *Legislation, *Treatment, *Project planning, Economic feasibility, Economics, Sanitary engineering, Environmental sanitation, Sewage effluents, Financing, Project feasibility, Water pollution treatment, Local governments, Waste treatment, Waste disposal.

A Regional Sewage Disposal Planning Revolving Fund is established under the North Carolina De partment of Administration for the purpose of advancing funds for planning and advance engineering work on collective regional sewage disposal projects between cities, counties, and sanitation districts. The applicant must repay the grant from the proceeds of bonds sold to finance construction of the project; however, repayment is not necessary where the project is not undertaken due to de-partmental direction for reasons of unfeasibility or inefficiency. Prior to approval the application must be referred to the Department of Water and Air Resources to ascertain whether the area is suitable for a regional project based on growth projections, the applicant proposes to unde long-term planning project to meet the needs of a high quality regional project, the applicant will coordinate the project with area wide land use planning, and the applicant will hire a licensed engineer to prepare a comprehensive regional disposal plan on a variety of technical matters. The prospects of financing the project exist and that the applicant will undertake the project. (Grant-Florida)

WATER POLLUTION CONTROL-SEWER AND DISPOSAL PLANT PROJECTS. Conn. Public Act No. 305 (1971).

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Descriptors: *Connecticut, *Legislation, *Sewage disposal, *Law enforcement, Legal aspects, Permits, State jurisdiction, Discharge (Water), Effuents, Administrative agencies, Adoption of practices, Municipal wastes, Water pollution sources, Waste water treatment, Sewage effuents, Sewage treatment. Identifiers: *Injunction (Prohibitory).

Identifiers: *Injunction (Prohibitory).

The Act requires that a municipality which has been ordered to construct a sewage treatment plant by the Connecticut Water Resources Commission establish a sewer authority and authorize the necessary funds to undertake the project. If any person or municipality violates these provisions the Commission is required to bring an action to enforce the statute by injunction. As to a municipal violator the Commission may alternatively advise the public works commissioner to take corrective measures, in which case the municipality's powers are suspended pending completion of the corrective measures. The municipality is also liable for certain state-incurred costs. If the municipality violates an injunction the comptroller may withhold state aid or grant payments to such municipality. A penalty of \$1,000 per day for continuance of a knowing violation of this act may be assessed in an enforcement action brought by the Water Resources Commission. (Grant-Florida)
W72-11946 W72-11946

INTERNATIONAL ASPECTS OF THE 1972 EN-VIRONMENTAL PROGRAM, Executive Office of the President, Washington,

Dep't. of State Bull, Vol. 66, p. 301-303, 1972.

Descriptors: *Oceans, *International waters, *International commissions, *United Nations, Oil spills, Law of the sea, Water pollution, Water pollution control, Waste disposal, International law, Ships, Water law, Pollution abatement, Water resources development, Federal government, Legal aspects, Legislation.

A United Nations Fund for the Environment should be established to stimulate international cooperation on environmental problems. This would help bring new resources to bear on the increasing problems of the environment through accreasing problems of the environment through activities such as monitoring and cleanup of the oceans. Further congressional action is needed to ratify pending international conventions and to adopt implementing legislation for various oil-spill conventions. Preparations are under way for the 1973 intergovernmental Maritime Consultative Organization Conference to draft a convention barring intentional discharges to the sea of oil and hazardous substances from ships. In conjunction with the Law of the Sea Conference of 1973, measures are being examined to control the effects of win the Law of the Sea Conference of 1973, measures are being examined to control the effects of developing undersea resources. Progress also has been made on an agreement to regulate ocean dumping of shore-generated wastes in the preparatory work for the 1972 United Nations Conference on the Human Equit. on the Human Environment. (Brackins-Florida) W72-11947

DEPARTMENT URGES SENATE APPROVAL
OF SEABED ARMS CONTROL TREATY,
Department of State, Washington, D.C.
J. N. Irwin, II.

Dep't. of State Bull, Vol. 66, p. 309-310, 1972.

Descriptors: *Treaties, *Beds under water, *Oceans, *International commissions, International waters, International law, Law of the sea, Water law, Legal aspects, Fedral government, Oceans, Coasts, Regulation, United Nations, Governments, Water resources.

The Seabed Arms Control Treaty, now before the Senate for its advice and consent, is designed to prohibit the spread of nuclear weapons and other weapons of mass destruction on the seabed, the ocean floor and the subsoil thereof. The Treaty weapons or mass destruction on the seabed, the ocean floor and the subsoil thereof. The Treaty was drafted at the Geneva Disarmament Talks and at the United Nations General Assembly. The Treaty will now come into force when the three depository governments—the United States, the United Kingdom and the Soviet Union—ratify it. A twelve-mile coastal seabed zone is excluded from coverage. Verification procedures, either by the party itself with the assistance of other parties or through the United Nations, is also provided. These provisions will assure parties that the Treaty is being observed without interfering with legitimate seabed activities. The Treaty, banning emplacement of weapons of mass destruction on nearly seventy per cent of the earth's surface, will help preserve the seabed environment for the benefit of mankind. It is therefore urged that the Senate give its advice and consent to ratification. (Brackins-Florida)

AN ACT RELATING TO WATER PURIFICA-TION AND WASTE WATER TREATMENT OPERATORS.

Fla. Laws Ch. 71-315 (1971).

Descriptors: "Florida, "Legislation, "Treatment facilities, "Waste water treatment, Water law, Legal aspects, Water purification, Regulation, Water quality, Administration, State governments, Permits, Water quality control, Waste water disposal, Waste water (Pollution), Water treatment, Sewage disposal, Sewage. Identifiers: Licenses.

The Division of Health of the Department of Health and Rehabilitative Services is authorized to Health and Rehabilitative Services is authorized to examine and certify all water purification and waste water treatment plant operators and to issue, deny, revoke and suspend annual operator certificates. A fee of ten dollars shall be charged for examination and certification and shall be deposited in the general revenue fund of the state. No person shall perform the duties of operator of a water or waste water treatment plant unless he holds a valid operator's certificate, except that this requirement shall not apply to public lodging establishments. The Secretary of the Department is given authority to promulgate rules, regulations and minimum standards to effectuate the provisions of the Act. (Brackins-Florida) W72-11950

CONTIGUOUS ZONES FOR POLLUTION CON-TROL, N. A. Wulf.

Journal of Maritime Law and Commerce, Vol 3, p 537-557, 1972. 39 ref.

Descriptors: *International law, *Water pollution control, *Coasts, *International waters, Oil industry, Law of the sea, Water law, Jurisdiction, Legal aspects, Regulation, Standards, Abatement, Compensation, Access routes, Water management (Applied). Identifiers: Contiguous zone.

The most authoritative evidence of existing inter-national law on the contiguous zone is the Conven-tion on the Territorial Sea and Contiguous Zone, tion on the Territorial Sea and Contiguous Zone, which advances a 12-mile contiguous zone. Within this zone some pollution control over foreign vessels may be authorized, but the rights of the coastal states are not absolute. The exercise of pollution control is limited to that which is reasonable to protect coastal state interests. The manner in which interests of the coastal state can be affected by shipping activities on the high seas, primarily the transport of oil is examined. Possible claims which coastal states could assert to deter intentional discharges are discussed. Coastal states could assert to the coastal states could assert to deter intentional discharges are discussed.

pollution or to abate further pollution from a maritime casualty by a right to intervention, requiring other ships to render assistance, and requiring vessels to carry on board remedial equipment. The coastal states can also assert claims to prevent the occurrences of maritime casualties by construction standards, manning and navigational requirements, and denial of access to areas deemed unsafe. And, finally, the coastal states can assert claims to obtain compensation for pollution damage. (Widman-Florida)

BETZ V. COTEAU (DEFENDANT'S LIABILITY FOR EROSION INTO NATURAL DEPRESSION FROM CONSTRUCTION ACTIVITY).

261 So. 2d 373-375 (La. Ct. App. 1972).

Descriptors: *Louisiana, *Drainage, *Surface ru-noff, *Surface drainage, *Damages, Drainage pat-terns, Floods, Drainage effects, Legal aspects, Ju-dicial decisions, Water law, Negligence, Adjacent land owners, Erosion, Land use, Drainage water,

Plaintiff lower landowner brought suit against defendant adjoining landowner for an injunction and
damages for flooding of plaintiff's land. During
construction by defendant, a retaining wall was
built and dirt was filled behind it over the height of
the wall. The dirt eroded onto plaintiff's land causing damage. Plaintiff's land was lower than any of
the surrounding land; as such his land had always
occupied a natural pocket subject to flooding.
Plaintiff contended that defendant was negligent in
the construction activity and was liable for
damages. Defendant denied negligence. The Louis
ainan Court of Appeals for the First Circuit held
that the evidence of the case failed to demonstrate
any appreciable damage which would warrant a
valid complaint. There was no question but that
defendant altered the physical characteristics of
the land and did accelerate the runoff of rain
water; however, it was because of the natural water; however, it was because of the natural depression of plaintiff's lot that most of his dif-ficulties arose. The Court held that any damages the plaintiff suffered from defendant's construction fell in the category of damnum absque injuria, that is the loss was not sufficient to warrant legal redress. The lower court holding was affirm (Brackins-Florida)

KALLEVIG V. HOLMGREN (SEPTIC TANK EF-FLUENT HELD NOT COMMON ENEMY). 197 N.W. 2d 714-720 (Minn. 1972).

Descriptors: *Minnesota, *Surface waters, *Adjacent landowners, *Reasonable use, *Adjudication procedure, Legal review, Alteration of flow, Legal aspects, Effuents, Competing uses, Diversion, Obstruction to flow, Relative rights, Septic tanks, Waste disposal, Water law, Common law, Judicial decisions.

Identifiers: *Common enemy rule.

Plaintiff, the owner of land subject to easement for drainage of water from adjoining land, brought suit for damages against defendant owners of adjoining land for unreasonable diversion of surface waters and overflow from a septic tank. The trial court rendered judgment for defendants and plaintiff appeared. The Supreme Court of Minnesota held that septic tank effluent was not a common enemy which could be discharged upon a neighbor's land within the reasonable use rule, but that erroneous instructions at trial, including that overflow of septic tank effluent was within the reasonable use rule, was not prejudicial, where evidence fell short of raising a jury issue as to whether waste was in fact part of runoff from defendant's land. The judgment of the lower court was therefore affirmed. (Widman-Florida)

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

DEPARTMENT DISCUSSES PROGRESS TOWARD 1973 CONFERENCE ON THE LAW OF THE SEA, J. R. Stevenson.

Dep't of State Bull Vol 66, p 672-679, 1972.

Descriptors: "Law of the sea, "Oceans, "Beds under water, "International commissions, International terrational waters, International law, Governments, Jurisdiction, Commercial fishing, Anadromous fish, Water resources, Water resources development, Water pollution, Water pollution control, United Nations, Regulation, Foreign waters, Water law, Legal aspects, Navigation, Coasts. Identifiers: "Contiguous zone.

In preparation for the 1973 Law of the Sea Conference there have been three meetings of the United Nations Seabed Committee and its ninetyone members. The meetings indicate agreement on the following elements: a twelve-mile territorial sea, with freedom of navigation and overflight beyond that limit; coastal state economic controls over fisheries and seabed resources beyond that limit; and an international regime for the seabed beyond the area of coastal state economic jurisdic-tion. The key unsettled issues are: how far beyond the twelve-mile limit should coastal state economic jurisdiction extend and should it be exclusive or subject to international standards; free transit through and over international straits; the nature of the international regime in the area beyond coastal state economic jurisdiction; and the nature of the legal regime for the control of marine pollution beyond twelve miles. The United States' policy is not opposed to delegating extensive controls over resources to coastal states or broad areas beyond the territorial sea; however, these controls must be based on an express delegation of authority from the international community and must take into account community interests. Specific positions of the United States on fisheries, seabed resources, scientific research and pol-lution are noted. (Brackins-Florida)

SIGNING OF GREAT LAKES WATER QUALI-TY AGREEMENT, J. Trudeau, and R. Nixon. Dep't. of State Bull, Vol 66, p 652-657, 1972.

Descriptors: *Great Lakes Region, *Water quality control, *Water pollution control, *Pollution abatement, United States, Canada, International Joint Commission, Lake Erie, Municipal wastes, Industrial wastes, Eutrophication, Phosphates, Nutrients, Spoil banks, Oil pollution, Thermal pollution, St. Lawrence River, Water pollution, Water quality, International waters, Water quality standards, Waste disposal, Waste treatment, Sewage effluents.

The United States and Canada have signed a Great Lakes Water Quality Agreement. Both general and specific water quality objectives are set forth in the Agreement. Some of the Water Quality Standards are stricter than existing state water quality standards. In many cases standards provide specific maximum amounts for particular substances. Additional funds will be appropriated by the United States government for the International Joint Commission and for municipal waste treatment programs. All commitments under this agreement are contingent upon new or continued congressional action. The agreement specifically deals with industrial and municipal wastes, eutrophication, Lake Erie, phosphates, agricultural pollution, pollution from vessels, sewage systems which combine sanitary and storm sewers, disposal of dredge spoils, oil and hazardous substances, thermal pollution and the International Joint Commission. The United States' costs of implementing control measures under the agreement will be approximately \$2.7 to \$3 billion for the next five years. Opening remarks of Prime Minister Trudeau and President Nixon are included. (Brackins-Florida) W72-11964

SUNAPEE DAM CORP. V. ALEXANDER (LIABILITY FOR MAINTENANCE ASSESSMENTS). 181 A. 120-125 (N.H. 1935).

Descriptors: *New Hampshire, *Dams, *Lakes, *Maintenance costs, Rivers, Water rights, Streamflow, Operation and Maintenance, Legislation, Mills, Dam construction, Outlets, Assessments, Maintenance, Power head, Costs, Judicial decisions, Legal review.

Plaintiff dam corporation brought suit to determine validity of its assessment against defendants for maintenance costs of its dam. Defendants contested this action on the grounds that: (1) the vote levying assessment was invalid in that certain water power owners were not included or subject to the assessment when the vote was taken, and (2) that even if the vote were valid, it would not be applicable to them in that they were not members of the dam corporation. The Supreme court of New Hampshire found the defendants to be assessible in that the vote as taken was a valid act of the corporation in accordance with its charter. Furthermore, defendants were considered members of the corporation in that they were owners of water power in the river served by the dam. Since the vote was valid and defendants were members of the corporation, plaintiff's assessment for maintenance must be upheld. (Barnett-Florida)

BOROUGH OF WILKINSBURG V. SCHOOL DISTRICT (LIABILITY OF SCHOOL DISTRICT FOR ENCLOSURE OF STREAM). 298 Pa. 193 A. 77-81 (1929)

Descriptors: "Pennsylvania, "Sewers, "Ditches, "Surface drainage, Judicial decisions, Legal aspects, Water law, Local governments, Assessments, Costs, Conduits, Drainage, Open channels, Drainage systems, Sewage disposal, Closed conduits, Channels, Legal review.

Defendant school district owned a twelve acre tract with a school on it and an open stream passing through it. Plaintiff borough decided to cover this natural water course and empty all the surface water from the region into another outlet. Plaintiff brought this claim to assess defendant for benefits accruing from work done. THE Supreme Court of Pennsylvania held that, pursuant to state statute, a school district can be assessed only for those benefits arising from the building of a sewer sewer connection. The court noted that the construction costs did not arise from the building of a sewer since the term 'sewer' means a large and generally underground passage or conduit for fluid or feculent matter, from a house or houses to some other locality, usually the place of discharge. In the present proceeding, the borough only directed the closing of the water course and its connection with an outlet for storm water, thus defendant could not be assessed for construction costs. (Johnson-Florida) W72-11966

WOODRING V. CITY OF EASTON (LIABILITY FOR WATER DAMAGE FROM NEGLIGENCE DURING CONSTRUCTION OF ELECTRICAL CONDUITS).

164 A. 921-925 (Super. Ct. Pa. 1933).

Descriptors: *Pennsylvania, *Electrical networks, *Closed conduits, *Water injury, Judicial decisions, Legal aspects, Water law, Road construction, Excavation, Surface drainage, Drainage systems, Manholes, Floods, Surface runoff, Runoff, Storms, Rain water, Flood damage, Damages, Paving.

The street on which plaintiff's store was located was in the process of being improved by laying thereon a concrete surface. Defendant power company preceded the laying of the surface by constructing an underground conduit system to carry

their electrical wires. Part of the system was a duct connecting a manhole with plaintiff's establishment. Defendant power company left the conduit going to plaintiff's basement uncapped at both ends, as they planned to install the wiring after completion of the street surface. The manhole cover was not in place when a heavy rainstorm occurred. Water flowed into the manhole and through the conduit into plaintiff's store. Plaintiff alleged the joint negligence of the power company and defendant paving contractor, who allegedly removed the cover. The jury found defendant jointly negligent in their actions and the Superior Court of Pennsylvania affirmed. (Johnson-Florida) W72-11967

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DIKLICH V. CTTY OF JOHNSTOWN (MUNICIPAL LIABILITY FOR INADEQUATE SEWERS).

180 A. 41-44 (Super. Ct. Pa. 1935).

Descriptors: *Pennsylvania, *Drainage systems, *Storm runoff, *Water injury, Judicial decisions, Legal aspects, Water law, Sewers, Sewage disposal, Cities, Local governments, Surface runoff, Flooding, Rainfall, Water control, Flood control, Overflow, Drains, Culverts.

Plaintiff's property was flooded several times during heavy storms because the sewers were inadequate to handle the excess water. The property was located on the north side of the street and a railroad embankment ran along the other side of the street. The street had been filled several times so that the grade was raised approximately one foot in front of plaintiff's property. The topography of the area resulted in large quantities of storm water draining to a point in the street near the property of plaintiff. Plaintiff brought suit against defendant city for damages sustained by these floods. Plaintiff's allegations included negligence in maintaining catch-basins for the water and allowing private sewage to drain onto plaintiff's property. The Superior Court of Pennsylvania reversed the trial court's judgment for plaintiff. The court held that defendant was not legally required to provide a sewer for every property owner and that there was no evidence of negligence by defendant in filling the street. The court noted that there is no liability on the part of a municipal corporation for the flooding of private property from the mere inadequacies of gutters, drains, culverts, or sewers. (Johnson-Florida) W72-11968

VAN RUYMBEKE V. PATAPSCO INDUSTRIAL PARK (CLAIMS RELATIVE TO ACCRETION). 276 A. 2d 61-74 (Ct. App. Md. 1971).

Descriptors: "Maryland, "Accretion (Legal aspects), "Ownership of beds, "Riparian land, Boundary disputes, Adjacent land owners, Equitable apportionment, Judicial decisions, Patent, Legislation, Navigable waters, Remedies, Riparian rights, Common law, Equity.

Plaintiff riparian landowners brought suit to eject defendant riparian landowners and holders of patent to submerged lands from land which allegedly accreted to plaintiffs' property. At trial the jury determined that the disputed land accreted to both plaintiffs' and defendants' property and judgement was entered in favor of plaintiffs for portions of the land which had accreted within the cove adjacent to plaintiffs' land. On appeal plaintiffs contended that the trial judge had erred in permitting the jury to determine whether any of the disputed land had accreted to defendants' property because defendants' patent was an infringement upon their riparian land and thus title to none of the accreted land could pass to defendants. The Court of Appeals of Maryland affirmed and held that where patent to submerged land was issued prior to enactment of statutes prohibiting underwater patents the trial judge did not err in per-

mitting the jury to determine whether any of the disputed land had accreted to patented land. The court further held that the proper measure of damages, when plaintiffs had made no claim for waste, was the rental value of the property. (Blank-Florida) W72-11969

WRIGHT V. CITY OF ROCK ISLAND (MU-NICIPAL LIABILITY FOR DRAINAGE OF SUR-FACE WATERS). 273 N.E.2d 83-86 (111 Ct. App. 1971).

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Descriptors: *Rainfall disposition, *Natural flow doctrine, *Drainage systems, *Diversion, *Flood routing, Flood control, Flood flow, Sewers, Rainfall, Rainfall intensity, Legal aspects, Judicial decisions, drainage effects, Drainage engineering, Dams, Ravines, Storms, Storm drains, Storm water, Watercourses (Legal aspects).

Plaintiff property owners sued defendant city to recover for water damage to their residence, al-legedly the result of defendant's diversion of surlegedly the result of defendant's diversion of sur-face waters from their natural course and failure to provide adequate drainage. The damage was caused as a result of rainfall coming over dams built to slow the descent of surface water through ravines. Drains had been constructed at each dam to drain water held by the dams. The drains had been found covered with debris after the rainfall. Plaintiffs contended that the drains were inadequate to handle even one year storms. Defenadequate to handle even one year storms. Defendant maintained that the system was designed to collect the water before it reached plaintiffs' property and that the extraordinary rainfall in this instance was unforesceable. The trial court granted defendant's motion for a directed verdict and the Appellate Court of Illinois affirmed. The court noted that the plaintiffs failed to prove that defendant diverted surface water onto plaintiffs premises. It held further that, where a municipality provides ample sewers and drains to carry off all water likely to accumulate under ordinary conditions. the fact that sewers and drains prove involved. water likely to accumulate under ordunary condi-tions, the fact that sewers and drains prove in-adequate to carry off all water from an extraordi-nary rain storm does not subject a municipality to liability for damages. (Ilkson-Florida) W72-11970

STATE CONSTITUTIONS AND THE ENVIRON-

WENT, Virginia Univ., Charlottesville. School of Law. A. E. D. Howard.

Virginia Law Review, Vol 58, p 193-229, Feb. 1972. 158 ref.

Descriptors: *Virginia, *Legislation, *Constitu-tional law, *Legal review, *Judicial decisions, *Adoption of practices, Public rights, Water law, Legal aspects, Federal government, State govern-ments, Decision making, Water management (Ap-plied), Public benefits, Planning, Environment. Identifiers: *Public trust, Standing.

Environmentalists and conservationists now seek to gain constitutional recognition of a right to a decent environment. Various proposals have been made to amend the Federal Constitution to guarantee this right, while some observers look to the courts to develop such a right from the existing Constitution. There has been action on another constitutional front-that of state constitutions. From the broad range of environmental provisions proposed or included in state constitutions, the following characteristic provisions are noted: statements of public policy; directives to legislatures to enact environmental legislation; directives tures to enact environmental legislation; directives to legislatures to acquire natural resources; authority to legislatures to act; restraints on disposition of public trust; disposition of environmental rights in individuals or in the people; provisions for citizens' suits; and tax advantages to encourage conservation. The Virginia Constitution is examined in terms of execution, mandate to agen-

cies and officers, judicial reveiw, public trust and restraints on governmental action, and standing. Virginia's new constitution is an example of the trend toward placing environmental quality along-side the precepts of the original framers. Those who pursue legal solutions to environmental problems might make better and fuller use of their state constitutions. (Widman-Florida) W72-11971

PUBLIC REGULATION OF WATER QUALITY IN VIRGINIA,
For primary bibliographic entry see Field 05G.
W72-11972

INDIVIDUAL LEGAL REMEDIES AGAINST POLLUTION IN ILLINOIS, Illinois Inst. of Tech., Chicago. Kent Coll. of Law. M. L. Leaby. Loyola University Law Journal, Vol 3, No 1, p 1-

Descriptors: *Illinois, *Legal review, *Water pol-lution, *Air pollution, Legislation, Legal aspects, Constitutional law, Judicial decisions, Law en-forcement, Water quality, Adoption of practices, Administrative agencies, State governments, Ad-ministration, Jurisdiction, Public health. Identifiers: *Illinois Environmental Protection

The 1970 Illinois Constitution creates the right to a healthful environment and the standing for an individual to enforce that right. The political and social developments which led to the incorporation of this provision into the 1970 constitution are discussed. Of particular concern is the scope of the term 'healthful' as opposed to similar adjectives which could have been used. Also discussed is the extent to which state enabling legislation and home rule units will affect the right. The right is enforcable against private persons and government, but there is a question whether an individual can sue to force government to perform its duty ment, but there is a question whether an individual can sue to force government to perform its duty under anti-pollution laws. The Illinois Environmental Protection Act is also discussed. This act permits a person to bring a complaint before the Pollution Control Board. Administrative organization under the Act is discussed, and case experience is analyzed. The scope of the constitutional and statutory rights are compared. The constitutional right is far broader since it is not limited to pollution: however, the constitutional right is to pollution; however, the constitutional right is limited to injury to health. The res jud cata problem between the statute and the constitution is also discussed. (Grant-Florida)

ADMINISTRATIVE, JUDICIAL AND NATURAL SYSTEMS: AGENCY RESPONSE TO THE NA-TIONAL ENVIRONMENTAL POLICY ACT OF 1969, R. A. Liroff.

Loyola University Law Review, Vol 3, p 19-48, 1972. 125 ref.

Descriptors: *Administrative decisions, *Administrative agencies, *Decision making, *Legislation, Water law, Legal aspects, Regulation, Adoption of practices, Legal review, Judicial decisions, Political constraints, Comprehensive planning, Planning, Political aspects, Projects, Project planning, Environmental effects, Water resources development. development.
Identifiers: *National Environmental Policy Act.

The National Environmental Policy Act is an effort to overcome the ecological shortcomings of incremental agency decision making by requiring exposure of proposed projects to environmental considerations. No longer is it legitimate for agency statements to be merely rationalizations for actions; the decision making process will have to be raised to the point where ecological impacts are

routinely considered and actually weighed. The Council on Environmental Quality was established by executive order in accordance with Title II of NEPA. The Council is given the responsibility of assessing environmental trends, developing national policies, and acting as advisor to the President. Unfortunately the Council was given a very small budget and only eighteen professional staffers. The Council has issued guidelines for agency compliance with NEPA. The diversity of NEPA cases indicates the large number of agency decision making systems to which the Act can be held applicable; yet it still is too soon to render a verdict on NEPA's administrative and judicial implementation. While two cases demonstrate the courts can vigorously enforce the Act, a brief overview of other NEPA cases suggests that judicial relief will not be unhesitatingly granted. (Brackins-Florida)

A PRELIMINARY SURVEY OF PUBLIC-R-ELATED AGENCIES IN HAWAII, Hawaii Univ., Honolulu. Water Resources Research Center. E. T. Morahan, and H. Yamauchi. Available from the National Technical Informa-tion Service as PB-211 154, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No. 55, May 1972, 93 p., 5 tab, 32 ref, 3 append, index. OWRR A-019-HI (1).

Descriptors: "Institutions, "Organizations, "Administrative agencies, Administration, "Governments, Management, Planning, Water policy, Economics, "Hawaii, "Water resources development, Institutional constraints.

The public water-related agencies of Hawaii may be regarded as only a portion of a complex institutional superstructure that functions in the water economy of the state. Conceptually, this institutional superstructure is just as much a part of the total water resources system in Hawaii as the physical sub-system exists for the ultimate benefit of mankind who has, through experience in conflicts, systematically developed the necessary institutions to facilitate orderly development and use of water resources. In this sense, both the physical and institutional sub-systems make up the total integrated water resources system of the state.

AN APPRAISAL OF PLANS TO MEET THE FRESH WATER REQUIREMENTS OF THE MISSISSIPPI GULF COAST AREA, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 06B. W72-12103

COMMUNITY ORGANIZATION PROGRAMS AND RELATIONSHIPS IN WATERSHED

AND RELATIONSHIPS IN WATERSHED DEVELOPMENT,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W72-12108

LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

For primary bibliographic entry see Field 05G. W72-12297

NEW ENGLAND RIVER BASINS COMMISSION ANNUAL REPORT FOR FISCAL YEAR 1971, E. R. Stoler.

Field 06-WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

(1971). 52 p, 1 map, 7 illus, 10 photo.

Descriptors: *Administrative decisions, *New England, *Water control, *Environmental control, *Comprehensive planning, *Adoption of practices, Administrative agencies, Administration, Planning, Project planning, Coordination, Decision making, Management, Water management (Applied), Water allocation (Policy), Water policy, Vaccutation, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988, 1988,

Identifiers: *New England River Basins Commis-

The New England River Basins Commission is a federal-state agency whose responsibilities extend to water and related land resources. The Commission accepts the interrelationship of water and land as a basic concept. How it is attempting to im-plement this concept is illustrated, problems, accomplishments, and ongoing programs are discussed, and the relationships of federal and discussed, and the remonstrate and rectal and state land use planning programs as they affect the region are assessed. Activities discussed include evaluation of a proposed nuclear generating facility at Seabrook, flood hazard area manag Boston Harbor coordination, investigation of the Connecticut River Basin, recommended priorities for 1972-1976, drainage research, coastal zone management and planning, and endorsement of the Allagesh Wilderness Waterway. Future projects include a Southeastern New England study, Long Island Sound study, further research on the Connecticut River Basin, investigation of problems in areas of power and the environment, problems in areas of power and the environment, and an integrated attack on the Nashua River aimed at ultimate total restoration. Recent land use policy developments in the area and pending federal legislation with its implications for the New England region are described. Appendixed are lists of Commission membership, staff, publications, and a financial summary. (Widman-Florida) W72-12298

POLLUTION OF THE SEAS BY CRUDE OIL-A PROPOSAL FOR EFFECTIVE REMEDIAL AC-

For primary bibliographic entry see Field 05G. W72-12300

THE REFUSE ACT OF 1899: KEY TO CLEAN

American Bar Association. Journal, Vol 58, p 468-471, 1972. 3 ref.

Descriptors: *Rivers and Harbors Act, *Law enforcement, *Pollution abatement, *Legislation, Legal aspects, Watercourses (Legal aspects), Judicial decisions, Water quality standards, Water pollution, Water pollution control, Federal gov ment, Administration, Regulation, Administrative agencies, Penalties (Legal), Permits, Wastes, Waste disposal, Industrial wastes, Navigable waters, Chemical wastes. Identifiers: *Refuse Act.

The Refuse Act has emerged as the primary pollution abatement statute on the federal level. Recent judicial decisions have held that the government can sue to enjoin violations of the Act. Since it is a criminal statute violations may be investigated by a Grand Jury. Most defendants are corporations and do not enjoy a Fifth Amendment privilege. Thus the Grand Jury can subpeona the corporation's officials and question them under oath as to what chemicals and refuse the plant discharges. This has proved to be a significant investigativeenforcement tool. Although the Act provides for a maximum fine of only\$2,500, courts have allowed prosecution of multiple counts, recognizing each day as a separate violation. The Act sets no standards, thus courts have adopted the most practical standard possible-maximum feasible abatement under present technology. There can be no more explicit mandate than is found in the Refuse Act, nor is there a more workable scheme of enforcement than is now evolving under the present statute. (Brackins-Florida) W72-12301

ENVIRONMENTAL LAW-THE REFUSE ACT, For primary bibliographic entry see Field 05G. W72-12302

EXPANSION OF THE ALASKA WATER

LABORATORY, Congress, Washington, D.C.; and House, Congress, Wash Washington, D.C.

N. Begich. Congressional Record, Vol. 118, No. 76, E 4891-E 4892 (daily ed.) May 10, 1972. 2 p.

Descriptors: *Legislation, *Alaska, *Laboratories, "Cold regions, Research and development, Federal government, Research facilities, Project feasibility, Project benefits, Water resources development, Environmental control, Environ-ment, Economic justification, Governmental interrelations, Expansion, Research priorities, Projects. On-site investigations.

The Hon. Nick Begich of Alaska comments on the Alaska Water Laboratory, which is a research effort of the Federal Environmental Protection Agency for the study of cold region environmental management. This research program is essential for the responsible development of Alaska, and the state seeks expansion of the project. Included is a joint resolution of the Alaska State Legislature relating to increased cold stress research at the Alaska Water Laboratory. In supporting this expansion the resolution stresses the following considerations: the laboratory is the only one of its Agency for the study of cold region environmental siderations: the laboratory is the only one of its siderations: the aboratory is the only one of its kind; the cold climate influences on the environment, and the mostly undefined methods of managing resources in cold climates; the significant influence of cold stress on the factors and systems necessary to the maintenance of a quality environment throughout a major part of North America; and the concern and effort of both the citizenry of Alaska and the Nation in instituting and maintaining measures essential to sound management and environmental protection. (Wid-man-Florida) W72-12303

THE LAW OF DRAINAGE.

North Dakota Univ., Grand Forks. School of Law. For primary bibliographic entry see Field 04A. W72-12304

UNITED STATES V. BOYD (RIPARIAN OWNER BECOMES OWNER OF ACCRETIONS TO ITS LOTS WHICH EXTEND LAKEWARD).

458 F. 2d 1252-1255 (6th Cir. 1972).

Descriptors: *United States, *Accretion (Legal aspects), *Boundaries (Property), *Riparian rights, Legal aspects, Water law, Judicial decisions, Boundary disputes, Adjacent land owners, Lake Michigan, Water rights, Riparian land, Water level fluctuations, Lake shores, Land farm-

Plaintiff United States brought suit to quiet title to and obtain possession of about thirty acres of land abutting Lake Michigan. Title was claimed by an individual whose title originated in a government patent issued in 1849. In the years between the patent issuance and the date of the deed of the individual claiming title, there was an accretion of land lakeward, the thirty acres now contested. The land lakeward, the thirty acres now contested. Ine individual contestants were granted only the accretion. The government contended that the grantors had no title to the accreted lands to con-vey to the individual contestants. The United States Sixth Circuit Court of Appeals held that a riparian owner becomes the owner to all accretion to its lands. The Court held that the government owned the land to which the accretion occurred and that to vest title to the thirty acres in the in-dividuals would destroy the Government's right of access to the lake as a riparian owner. Therefore the Court reversed the District Court and re-manded the case for further proceedings con-sistent with this opinion. (Brackins-Florida)

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JACKLOVICH V. INTERLAKE, INC. (QUI TAM ACTION MAY NOT BE MAINTAINED UNDER RIVERS AND HARBORS ACT). 458 F.2d 923-927 (10th Cir. 1972).

Descriptors: "United States, "Rivers and Harbors Act, "Watercourses (Legal aspects), "Pollution abatement, Legalation, Legal aspects, Judicial decisions, Water pollution, Water pollution control, Industrial wastes, Penalties (Legal), Waste disposal, Water pollution sources, Law enforcement, Wastes, Federal government. Identifiers: "Refuse Act of 1899, "Qui tam actions.

Plaintiff private citizen sued under the Refuse Act of the Rivers and Harbors Act of 1899 in a qui tam of the Rivers and Harton's Act of 1699 in a quit am action to impose a fine upon defendant steel mill. The United States Attorney had decided not to prosecute defendant. Plaintiff alleged that defen-dant was discharging refuse matter from its steel mill into the Little Calumet River. Plaintiff further asserted that his qui tam action was justified by prior case law. Defendant moved that the com-plaint be dismissed for failure to state a cause of action. The United States Court of Appeals for the Seventh Circuit held that only the United States government may bring and prosecute an action to impose a penalty under the provision of the Rivers and Harbors Act providing for imposition of criminal fines for violations and which does not commai times for violations and which does not expressly authorize qui tam actions. The court held that since plaintiff's right to recover half the fine depended upon a conviction in proceedings brought by the government, plaintiff was remediless here; the United States Attorney could not be compelled to initiate a criminal action against defendant. Therefore the District Court decision was affirmed. (Brackins-Florida) W72-12306

MCMILLEN DEVELOPMENT CORP. V. BULL (ALTERATION OF DRAINAGE FLOW BY UPPER LAND OWNER ONTO LOWER LAND).

188 S.E.2d 491-493 (Ga. 1972).

Descriptors: "Georgia, "Drainage patterns, *Drainage systems, "Subsurface drainage, Legal aspects, Judicial decisions, Watercourses (Legal aspects), Water law, Drainage, Drainage effects, Adjacent landowners, Flow, Flow alteration, Subsurface flow, Streamflow, Surface water. Identifiers: *Nuisance (Legal aspects).

Plaintiff lower landowner used defendant upper landowner for damages and an injunction to prohibit defendant from allowing debris to accu-mulate and remain in a stream flowing through plaintiff's property, and from continuing to clog and stop the natural flow of water through the un-derground drainage system in the stream running through such property. Defendant denied these al-legations. The Georgia Supreme Court held that one land proprietor has no right to concentrate and collect surface waters and thus cause them to be discharged upon the land of a lower proprietor in greater quantities, or in a manner differently from greater quantities, of in a mainer durier in your that in which the water would be received by the lower estate if it simply ran down upon it by the law of gravitation. Here the evidence amply showed that the acts of the defendant constituted a nuisance which would continue during every period of heavy rainfall in recurrence of the injury. Therefore the Supreme Court affirmed the grant of the interlocutory injunction by the lower court. (Brackins-Florida) W72-12307

POOLE V. GUSTE (LIABILITY FOR ALTER-ING DRAINAGE PATTERNS).

262 So.2d 339-348 (La. 1972).

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ed a very ury. Descriptors: *Louisiana, *Easements, *Drainage water, *Prescriptive rights, Drainage, Drainage effects, Water law, Legal aspects, Judicial decisions, Surface drainage, Runoff, Adjacent land owners, Canals, Watercourses (Legal aspects), Drainage area, Drainage practices, Legal review. Identifiers: Injunctions (Prohibitory).

Identifiers: Injunctions (Prohibitory).

Plaintiff landowner sued for damages and injunctive relief against defendant adjacent landowner who built levees obstructing drainage flow from plaintiff's land onto defendant's land. In 1916 the predecessors in title of the parties agreed to the construction of a drainage canal running from plaintiff's to defendant's land. Prior to construction of the canal the natural drainage of surface waters was from plaintiff's land onto defendant's. Plaintiff contended that its estate enjoyed a drainage servitude through the canal on defendant's property. Defendant contended plaintiff had an adequate remedy of law, thus an injunction was improper; that he would be denied due process if property rights of the plaintiff's estate are recognized; and that plaintiff should furnish his own drainage. The Louisiana Supreme Court held the evidence supported the lower court's finding that plaintiff's estate enjoyed a servitude of drain, in part natural and in part prescriptive, onto defendant was not entitled to erect obstacles to drainage of waters from the dominant estate even in order to protect the servient estate from tidal flow. (Brackins-Florida)

AN ACT....RELATING TO WATER POLLU-TION CONTROL, WATER SUPPLY AND SEWER SEPARATION PLANNING ASSISTANCE AND GRANTS.

Vt. Pub. Acts No. 97 (1971).

Descriptors: *Vermont, *Legislation, *Water pol-lution control, *Grants, *Sewage districts, Water supply, State governments, Municipal wastes, Ad-ministrative agencies, Regulation, Construction, Priorities, Technology, Contracts, Administrative decisions, Sewage disposal, Sewage treatment.

The act first enumerates the procedure required to form a consolidated sewer district and provides that such a body shall be eligible to receive state aid. The act provides for aid to municipalities for water supply, pollution abatement, sewer separation, and engineer planning. Requirements for payment and repayment, priorities and limitations, appeal of decisions, and administrative regulations are set forth. Construction grants in aid for specified water supply, pollution abatement, and sewer separation projects are provided. The act makes provisions for the method of obtaining grants, priorities to be followed, appeal, and administrative regulations. The act provides for technical and other services to municipalities and details the method of application, form of condetails the method of application, form of contracts to be used, eligibility, and limitation. (Widman-Florida)
W72-12309

ENVIRONMENTAL PROTECTION ACT OF 1971. Conn. Public Act No. 96 (1971).

Descriptors: *Connecticut, *Legislation, *Environmental effects, *Public rights, *Legal

aspects, Legal review, Administrative decisions, Adoption of practices, Equity, Administrative agencies, State governments, Planning, Regula-tion, Ecology, Jurisdiction. Identifiers: Public trust doctrine.

Identifiers: Public trust doctrine.

After a brief policy statement the Act authorizes citizen saits for such declaratory and equitable relief necessary to protect the public trust in the air, water, and other natural resources of the state from unreasonable pollution, impairment or destruction. After the plaintiff has made a prima facie showing of conduct likely to adversely affect the environment the defendant may prove, by way of an affirmative defense, that considering all relevant circumstances there is no reasonable alternative and that such conduct is in fact reasonable. The court may grant temporary and permanent relief, or may impose such conditions on the defendant as are required to protect the public trust. The court may remand the parties to such proceedings as are necessary to determine the legality of the defendant's conduct. Where judicial review is available as to any other proceeding the court originally taking jurisdiction shall maintain jurisdiction for purposes of judicial review. The Act authorizes intervention by third parties. No conduct having an adverse environmental effect shall be approved if there is a feasible alternative. The Act shall be supplementary to existing administrative and regulatory procedures provided by law and in any action maintained under this Act the court may remand the parties to such procedures. (Widman-Florida)

WATERS...PERMITS FOR NEW DISCHARGES.

Conn. Public Act No. 163 (1971).

Descriptors: *Connecticut, *Legislation, *Permits, *Discharge (Water), Administrative decisions, Legal review, Legal aspects, Administrative agencies, State governments, Water pollution, Water management (Applied), Standards, Management, Water pollution control, Effluents, Water law.

This act provides that if, upon receipt of an appli-cation for a permit for new discharges into state waters the commission finds that such discharge waters the commission finds that such discharge would not cause pollution, it shall issue a permit. If the commission finds that such discharge would cause pollution, it shall require the applicant to submit plans and specifications of a proposed system to treat such discharges. If the commission finds that the proposed system will protect state waters from pollution, it shall notify the applicant of its approval, and when such system is installed in full compliance with the approval the commission shall issue the permit. No permit shall be allowed for any discharge which would be below the highest standard set by the act. If the commission finds that the proposed system does not protect finds that the proposed system does not protect state waters it shall promptly notify the applicant of the denial and reasons therefore. Such applicant shall have a right to a hearing and an appeal therefrom. (Widman-Florida) W72-12311

WATER POLLUTION CONTROL-TREATED SUBSTANCES-DISCHARGE. Conn. Public Act No. 191 (1971).

Descriptors: "Connecticut, "Legislation, "Water pollution control, "Discharge (Water), State governments, Legal aspects, Rivers, Law enforcement, Penalties (Legal), Sewage effluents, Administrative agencies, Adoption of practices, Tertiary treatment.

This act regulates the discharge of treated sub-stances into certain streams or rivers. The act pro-vides that no person shall discharge into class A waters of the state sewage or any other effluent

which is less than tertiary treated. No person shall discharge into the Salmon river or any of its tributaries any sewage or any other effluent which is less than tertiary treated. Any person violating these sections shall be subject to the penalties of section 25-31 of the general statutes. For purposes of the act, 'person' means any individual, partnership, association, firm, corporation or municipality, and includes any officer or governing or managing body of any partnership, association, firm, corporation or municipality. (Widman-Florida)
W72-12312

WATER POLLUTION CONTROL-PERMITS FOR NEW DISCHARGES-HEARING, Conn. Public Act No. 346 (1971).

Descriptors: "Connecticut, "Effluents, "Discharge (Water), "Legislation, "Permits, Administrative agencies, Adoption of practices, Waste water disposal, Waste water treatment, Treatment facilities, Legal aspects, Water resources development, Water pollution, State jurisdiction, Environmental effects, Law enforce-

ment.

The Act requires that the Connecticut Water Resources Commission hold a hearing on all applications for a discharge permit between 30 and 60 days after receipt thereof. After the hearing the Commission must issue the permit if it finds that the discharge would not cause pollution of any state waters. If it finds that pollution would result it shall require the applicant to submit plans and specifications of its effluent treatment system. If the Commission finds that the proposed treatment system will protect the state waters it shall issue a permit upon installation of the treatment system. If the Commission determines that the proposed treatment system will not be satisfactory it must notify the applicant and the applicant shall have the right to a hearing. Any person or municipality aggrieved by an abatement order of the Commission may, after a hearing, appeal the final determine if the Commission. The court shall determine if the Commission acted arbitrarily, unreasonably, or contrary to law. Provisions are made for an expeditious certification of proper questions of law to the State Surgence Court for made for an expeditious certification of proper questions of law to the State Supreme Court for review. (Grant-Florida) W72-12313

CONSTITUTIONAL LAW-FEDERAL PREEMPTION OF STATE REGULATORY AUTHORITY-FEDERAL GOVERNMENT HAS SOLE
AUTHORITY UNDER ATOMIC ENERGY ACT
TO REGULATE RADIOACTIVE WASTES
DISCHARGED FROM NUCLEAR POWER
PLANTS-NORTHERN STATES POWER CO. V.
MINNESOTA,
For primary bibliographic entry see Field 05G.
W72-12314

JUDICIAL RECOGNITION OF THE SUBSTAN-TIVE REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, For primary bibliographic entry see Field 05G. W72-12316

A STRUCTURAL MODEL FOR A WORLD EN-VIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE, For primary bibliographic entry see Field 06G. W72-12317

SOME PROBLEMS OF WATER RESOURCE MANAGEMENT IN VIRGINIA: A PRELIMINA-RY EXAMINATION, College of William and Mary, Williamsburg, Va. For primary bibliographic entry see Field 06B. W72-12318

Field 06-WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

THE POLLUTION FIGHT BEFORE THE U.S. Michigan Univ., Ann Arbor. School of Law. J. L. Sax.

UNESCO Courier, Vol 24, p 20-23, July 1971. 2

Descriptors: *Legal review, *Public rights, *Judicial decisions, *Administrative decisions, Adoption of practices, Administrative agencies, Decision making, Planning, Political aspects, Court decisions, Control, Governmental interrelations, Coordination, Governments, Legal aspects, Project planning.

Significant developments are occurring in the area of environmental litigation. Private citizens are bringing numerous lawsuits as members of the public against the very governmental agencies public against the very governmental agencies which are themselves supposed to be protecting the public interest. Such lawsuits are indications of a citizens' revolt against official protection of the public interest. The recent oil leakage at Santa Barbara, California, is used as an example. Regulatory agencies have an interest and perspective of their own which is frequently at odds with that of significant segments of the public whose interest the agency is supposed to be protecting. Thus citizens have been turning increasingly to the s have been turning increasingly to the courts because the judiciary offers an opportunity to bring a fresh and uncommitted perspective, an outsider's perspective, to environmental problems. The goal of such litigation is to move questionable environmental decision making into a forum where issues of policy must be made and ar-ticulated openly, and where legislators must assess the political consequences of one position over another. A great deal of rethinking about laissez-faire attitudes and assumptions about the process of government is needed. (Widman-Florida) W72-12320

WATER POLLUTION, American Univ., Washington, D.C. For primary bibliographic entry see Field 05G.

THE FEDERAL GOVERNMENT AND THE EN-

VIRONMENT, Senate, Washington, D.C. G. S. McGovern. Current History, Vol 59, p 82-83, 110, August 1970.

Descriptors: *Penalties (Legal), *Environmental control, *Federal government, *Legislation, *Legal aspects, Administrative decisions, Federal budget, Legal aspects, Pollutants, Social aspects, Decision making, Adoption of practices, Governments, Regulation, Planning, Public rights, Legal

Pollution of our environment is already so extensive that the federal government must play a major role in confronting this national problem. Congress role in contronting this national problem. Congress has created a legislative framework for improving our environment. Among the most important laws adopted in recent years are the Water Resources Act of 1964, the Water Resources Planning Act of 1965, the Highway Beautification Act of 1965, the Clean Air Act of 1965, the Air Quality Act of 1967, the Clean Water Restoration Act of 1966, the Solid Weste Act of 1965 and the National Enginement Waste Act of 1965, and the National Environmen-Waste Act of 1965, and the National Environmental Policy Act of 1969. New life must be breathed into the law by the appropriation of adequate funds. In addition, this positive program must be accompanied by stiffer penalties against industrial and municipal discharge into lakes and rivers. The author and Senator Philip Hart (D. Mich.) have proposed the Environmental Protection Act of 1970. The act would authorize any person to bring proposed the Environmental Protection Act of 1970. The act would authorize any person to bring suit in federal court against any person or organization which is causing pollution. The court would be empowered to order action to be taken that would end the offending pollution once the plaintiff proved his case. This act would

strengthen the right of individuals to use the federal government's judicial system to protect their own environment. (Widman-Florida) W72-12322

FROM POLLUTION ABATEMENT TO QUALI-

TY CONTROL, Senate, Washington, D.C. For primary bibliographic entry see Field 05G. W72-12323

UNITED STATES AND U.S.S.R. TABLE REVISED DRAFT TREATY BANNING EM-PLACEMENT OF NUCLEAR WEAPONS ON THE SEABED.

J. F. Leonard. Department of State Bulletin, Vol 62, p 663-667, 1970. append.

Descriptors: *Treaties, *International waters, Water resources, Beds, Beds under water, Inter-national law, Foreign waters, Water policy, Water law, Oceans, Law of the sea, International compacts, Regulation, Governments, United Nations, United States. Identifiers: USSR.

The United States and the Soviet Union have been developing a treaty banning emplacement of nuclear weapons and other weapons of mass destrution on the seabed, the ocean floor, and the subsoil thereof. The United Nations Conference of the Committee on Disarmament has promulgated a second revised draft treaty which represents a compromise agreement among the participants. The treaty exempts from prohibition a twelve-mile seabed zone, the territorial waters of a coastal state. A number of minor changes were made in the international procedures for checking violations of the treaty; the treaty provides for ob-servation and consultation to resolve disputes arising under the treaty, or a state party may refer the matter to the security council. A review conference after five years is also provided for in order to review the operation of the treaty. Provi-sions are also included for withdrawal from the treaty by a state party if the supreme interests of the nation are jeopardized. The treaty shall enter into force after approval by the General Assembly and the signing by twenty-two governments. (Brakins-Florida) W72-12324

FARMINGTON RIVER POWER CO. FEDERAL POWER COMMISSION (AUTHORITY OF FEDERAL POWER COMMISSION TO REQUIRE LICENSING OF DAM IN NON-NAVIGABLE WATERS).

455 F.2d 86-91 (2nd Cir. 1972).

Descriptors: *United States, *Hydroelectric project licensing, *Dams, Non-navigable waters, Hydroelectric plants, Legal aspects, Judicial deci-sions, watercourses (Legal aspects), Legislation, Regulation, Administrative agencies, Legal Regulation, Administrative agencies, Legal review, Water law, Rivers and Harbors Act, Federal government, Dam construction. Identifiers: *Federal Water Power Act, *Federal Power Comm., Licenses, Interstate commerce.

Plaintiff power company sought review of an order of defendant Federal Power Commission requiring plaintiff to obtain a license to maintain its dam across a nonnavigable stream. The dam was built in 1925. The Commission contended that the Federal Water Power Act of 1920 required plaintiff to obtain a license, and alternatively, that a 1935 Amendment to the Act, requiring the filing of a declaration of intent prior to constructing a project in nonnavigable waters, should be given retroactive effect against plaintiff. Then if the Commission should determine that the project would affect interstate commerce, it could require licensing. The Second Circuit Court of Appeals held that the 1920 Act does not require the licensing of a project in nonnavigable waters, even if it might affect interstate commerce, and that the 1935 Amendment was not intended to have retroactive effect. Thus the court held that the Commission was without authority to require the plaintiff to obtain a license to maintain its dam and vacated the order of the Commission. (Brackins-

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GULF OIL CORP. V. TUG GULF EXPLORER (DUTY OF SUBMARINE PIPELINE OWNER TO AVOID RUPTURES).

337 F. Supp. 709-717 (E.D. La. 1971).

Descriptors: *United States, *Negligence, *Pipelines, *Oil spills, Legal aspects, Judicial decisions, Permits, Water law, Law of the Sea, Navigable waters, Navigation, Water pollution sources, Oil industry, Oceans, Oil pollution, Accidents Shine cidents, Ships.

Plaintiff owners of an oil pipeline and a derrick barge sued defendant tug owner for damages occa-sioned by the pipeline's rupture. Defendant's tug was towing a barge engaged by plaintiff pipeline owner to work in the construction of a platform owner to work in the construction of a platform near a submarine pipeline. Due to bad winds and seas the barge drifted and its anchor became entangled with the pipeline. Consequently the pipeline broke, causing an oil spill. Plaintiffs contended that the damage was a result of the tug's negligence. The United States District Court for the Eastern District of Louisiana held that an awarer of a submarine principle place a continuing owner of a submarine pipeline has a continuing duty to maintain the pipeline at least three feet duty to maintain the pipeline at least three fee-below the water bottom in accordance with a per-mit issued to it by statutory authority. The evidence established that the plaintiff was negligent in failing to warn navigators of the cur-rent location of the pipeline and in not maintaining the pipeline below the water bottom. Judgment was entered in favor of defendants. (Brackins-Plantich) Florida) W72-12326

UNITED STATES V. 1,629.6 ACRES OF LAND, MORE OR LESS, IN THE COUNTY OF SUSSEX, STATE OF DELAWARE (A RIPARIAN LANDOWNER CANNOT BE MADE NON-RIPARIAN BY ACCRETION), 335 F.Supp. 255-277 (D. Del. 1971).

Descriptors: *United States, *Riparian rights, *Boundaries (Property), *Accretion (Legal *Boundaries (Property), *Accretion (Legal aspects), *Delaware, Riparian land, Erosion, Boundary disputes, Avulsion, Water rights, Legal aspects, Water law, Judicial decisions, Ownership aspects, Water law, Judician decessins, Ownersing of beds, Beds under water, Adjacent landowners, Eminent domain, Condemnation, Compensation, Navigable waters, Channels, Prescriptive rights, Artificial watercourses, Low-water mark.

Plaintiff United States commenced a condem tion suit during which the District Court in Delaware had to determine ownership of disputed land between the two defendants, adjacent proper-ty owners, for purposes of establishing just com-pensation. A main issue involved the ownership of pensation. A main issue involved the ownership of land formed by accretion. The eastern property owner claimed title to the land asserting that it in tially attached to his land. The western property er refuted this and contended that the ment that an alluvium be contiguous is not absolute and may be avoided when a court must do so to maintain an individual's riparian boundary. The Court held that a riparian landowner cannot be made non-riparian by accretion; regardless of the manner in which alluvium accretes or to whom it initially attaches, the riparian owner in front of whose land it forms gets title to it. Thus, the Court allocated the alluvium to the western property owner in order to preserve his riparian rights, and ordered a special commission to calculate the ap-propriate compensation in accord with the holding. (Brackins-Florida) W72-12327

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ORAL PROCEEDINGS—APPROACHES TO OIL POLLUTION RESPONSIBILITY (PACEM IN MARIBUS CONVOCATION AT VALLETTA, MALTA-1971). For primary bibliographic entry see Field 05G. W72-12328

KALMAN V. HUTCHESON (FLOWAGE RIGHTS). 276 A.2d 260-264 (N.H. 1971).

Descriptors: *New Hampshire, *Easements, *Alteration of flow, *Mill dams, *Riparian rights, *Riparian land, Legal aspects, Judicial decisions, Ownership of beds, Artificial use, Competing uses, Obstruction to flow, Recreation, Riparian waters, Water management (Applied), High water mark, Boundary disputes, Ponds. Identifiers: *Flowage rights.

Plaintiff riparian landowner brought action to require removal of obstructions to flow of a brook. Defendant riparian land owners and successors to dam sites and flowage rights filed an answer requesting that plaintiff remove a fence on defendants' land. Plaintiff claimed that right to flow the pond area was acquired by defendants' predecessors in title for the purpose of operating a mill and that their flowage rights could not be maintained for any other purpose. Additionally plaintiff claimed that whatever flowage rights the defendants had were lost by abandonment. The master found for the defendants and the Supreme Court dants nad were jost by abandonment. The master found for the defendants and the Supreme Court of New Hampshire affirmed. The court held that the evidence showed a long history of the water being maintained at an even higher level than at trial, that defendants had made prompt repairs to the dam, and that defendants had at times used the pond for recreational purposes; therefore, plain-tiff's claim of abandonment was denied. The court til's claim of abandonment was denied. In ecour-also ruled that although defendants' predecessors in title had acquired flow rights for the purpose of mill operations, it is well settled that an easement may be maintained for a purpose not contemplated when it was created. (Blank-Florida) W72-12329

GENERAL STATEMENT OF PRINCIPLES TO BE INCLUDED IN STATE WATER RIGHTS LAWS.

American Society of Civil Engineers, New York. Committee on Water Laws.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 317-322, June 1972.

Descriptors: "Water rights, "Appropriation, "Ad-judication procedure, State jurisdiction, Ground-water, Water quality, Controlled drainage, Prior appropriation.

This is a consensus report that has been in preparation since March, 1965. Its primary purpose is to allow and encourage others to enter in formalized Discussion. After the Discussion is formalized Discussion. After the Discussion is closed the Committee will consider all suggestions before preparing a final statement. Items covered include policy objectives, vested rights, fundamental principles of priority, water filings, appropriation limited to specific quantity, completion of work, proof of beneficial use, adjudication, forfeiture, change in point of diversion, eminent domain, groundwater, water quality, drainage requirements, safety of structures, administration and interstate water resources. The principle of priority should be followed in all circumstances, limitations should be placed on the use of water in

exercising basic rights and time limits should be set for beneficial use. Other main points made are that groundwater appropriation should follow the same general principles as surface water, states should set quality standards and interstate water resources should be governed by interstate com-pacts. (Casey-Arizona) W72-12361

6G. Ecologic Impact of Water Development

WATER: LIVING MILIEU, State Coll. of Agronomical Science, Gembloux (Belgium). For primary bibliographic entry see Field 05G. W72-11804

MONITORING FOR EFFECTIVE ENVIRON-MENTAL MANAGEMENT, Battelle Memorial Inst., Columbus, Ohio. Colum-For primary bibliographic entry see Field 05A. W72-11921

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER-LEGISLATIVE REFORMS TO IMPROVE THE BALANCING

PROCESS, Atomic Energy Commission, Washington, D.C. For primary bibliographic entry see Field 06E. W72-11940

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 08A. W72-11949

MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATE-MENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-11951

T OR C-WILLIAMSBURG ARROYOS WATERSHED, NEW MEXICO (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. Watershed Planning Div. For primary bibliographic entry see Field 08A. W72-11952

SMALL BOAT HARBOR ON THE SOUTH SHORE OF LAKE ONTARIO AT OAK ORCHARD HARBOR, NEW YORK (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 08A. W72-11954

MYERS CHUCK HARBOR, MYERS CHUCK, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08A.
W72-11955

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Detroit, Mich. For primary bibliographic entry see Field 05G. W72-11956

PROPOSED SEWAGE TREATMENT FACILI-TIES, SOLDOTNA, ALASKA (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 05D.
W72-11957

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 08A. W72-11958

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W.Va. For primary bibliographic entry see Field 08A. W72-11959

PHYSICAL ENVIRONMENT OF THE NA-TIONAL REACTOR TESTING STATION, IDAHO-A SUMMARY, Geological Survey, Washington, D.C. R. L. Nace, M. Deutsch, and P. T. Voegeli. Available from GPO, Washington, DC 20402, Price \$1.00. Geological Survey Professional Paper 725-A. 38 p, 8 fig, 1 plate, 10 tab, 22 ref, append.

Descriptors: *Data collections, *Hydrologic data, *Idaho, *Climatic data, *Environment, Ecology, Water resources, Surface waters, Groundwater, Hydrogeology, Climatology, Meteorology, Identifiers: *National Reactor Testing Station

The U. S. Geological Survey undertook a study in 1948 of the geologic and hydrologic features of potential sites for construction and operation of a National Reactor Testing Station (NRTS). Areal geologic mapping and detailed stratigraphic studies of lithologic units were carried on with special attention to hydrology. These studies were aided by an exploratory drilling program which resulted in completion of 42 test hoses by 1956. Other field investigations consisted of geophysical exploration, gamma-ray logging, and experimental terrestrial electropotential surveying. Laboratory determinations included chemical and radiometric analyses of groundwater and mineralogic, hydrologic, hydrologic, hydrologic, hydrologic, hydrologic, hydrologic, hydrologic, hydrologic, ocomparatively young volcanic inyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic, nyarotogic al characteristics of rock materials. The plain consists largely of comparatively young volcanic rocks interbedded with lacustrine, eolian, and alluvial sediments. The NRTS has no well-defined integrated surface-water drainage system and it is not crossed by perennial streams. Landforms of the plain consist of volcanic features, alluvial features, lake floors and playas, and eolian features. The climate of the Snake River Plain in the vicinity of the NRTS is semiarid. Water for use on the NRTS ordinarily is obtained from wells. Water uses include reactor cooling and moderating, cooling and shielding for temporary storage of spent nuclear-fuel elements, washing and decontaminating, chemical processing, landscape maintenance, culinary and sanitary use, and fire protection. As of 1968, annual pumpage was about 2 billion gallons, of which about 50% was consumptively used. (Knapp-USGS)

NATURAL AREAS, W. H. Moir. Science, Vol 177, No 4047, p 396-400, August 4,

Descriptors: "Natural resources, "Land use, *Forest management, "Governmental interrela-tions, Planning, Legislation, Monitoring, Conser-vation, Ecosystems, Watershed management, Pol-lution abatement.

Field 06-WATER RESOURCES PLANNING

Group 6G—Ecologic Impact of Water Development

Identifiers: *Natural areas, Land and Water Con-servation Fund Act, Landscape change.

Natural areas are defined as they are envisioned by many scientists; some of the forces that have advanced or opposed natural areas as a basis for policies of land use are examined; and uses that can be made of the unique kind of scientific information they contain are discussed. Natural areas play a crucial role in the repidly changing land-scape for, while harboring valuable species, they also serve as bench marks in evaluating landscape change. Characteristics of natural areas are described and various policy statements and definitions are given. The role of the Forest Service in developing a program of management of vice in developing a program of management of forested lands from the time there was no official policy (1922) until the 1960's when a marked uppoacy (1922) unit the 1900's when a marked up-surge of interest came about, which produced a long list of conservation legislation including the Wilderness Act of 1964 and the Land and Water Conservation Fund Act of 1964, is presented. Natural areas are seen as environmental monitoring systems for measuring various ecosystems. W72-12039

ECOCIDE AND THOUGHTS TOWARD SUR-

James E. Freel and Associates: Palo Alto, Calif., 1971. 202 p. Identifiers: Advances, Books, Ecocide, *Ecology, Smog, Survival, *Technology.

This book is one of a new series from the Center for the Study of Democratic Institutions at Santa Barbara, California prepared especially for use as a college reader. It deals with the ecological problems created by modern technological advances and the resultant depletion of natural resources. The contents are divided into 2 parts, the environmental crisis and thoughts toward survival. The following papers are included: Ecocatastrophe, by H. Wheeler; An inventory of disaster, by P. R. Ehrlich and J. P. Holdren; The disaster, by P. R. Ehrlich and J. P. Holdren; The cologist's role and the non-solution of technology, by W. Murdoch and J. Connell, Federal policy and the ecological crisis, by W. O. Douglas; and Beware the technological experts, by J. W. Gofman and A. R. Tamplin. The following contributions were presented in part 2, thoughts toward survival: Planning - so there will be a future, by K. E. F. Watt; the elimination of smog, by E. Contini; environment and the law, by W. M. Kitzmiller; cooperations, government and the environment, and the environmental bandwagon, by A. King. and the environmental bandwagon, by A. King. No lists of references or indices are provided.—Copyright 1972, Biological Abstracts, Inc. W72-12261

A STRUCTURAL MODEL FOR A WORLD EN-VIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE,

L. D. Levien. The George Washington Law Review, Vol. 40, p. 464-495, 1972. 102 ref.

Descriptors: *International law, *Administrative agencies, *Adoption of practices, *Pollution, Legal aspects, Political aspects, Technology, Political constraints, Institutional constraints, Decision making, Standards, Oceans.

A need exists for a world environmental organization to monitor and regulate pollution. How a prototype world environmental organization (WEO) could be patterned after the International Labor Organization (ILO) is illustrated. ILO history is discussed. Similarities between ILO and WEO include a central information source and similar goals of raising member nation standards. There are also several differences between the two: ILO has a human rights aspect not applicable to WEO, WEO must function in non-sovereign areas, and the two would have different methods

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of enforcing standards and different concepts of liability. Structurally ILO is a tripartite body in the sense that government, employers, and labor from each member nation are represented. This framework could be readily adapted to establish a WEO. Standard setting is another facet of ILO which is readily adaptable. ILO furnishes technical assistance to underdeveloped member nations. Although these are more differences in the time of Although there are many differences in the type of assistance offered, WEO would also have to furnish such aid to be viable. (Grant-Florida)

THE FEDERAL GOVERNMENT AND THE EN-

VIRONMENT, Senate, Washin ton, D.C. For primary bibliographic entry see Field 06E. W72-12322

CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 08C.

TULATIN PROJECT, OREGON (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12331

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 04A. W72-12332

BIRON PROJECT NO. 2192 ON THE WISCON-SIN RIVER IN WOOD AND PORTAGE COUN-TIES, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Consolidated Water Power Co., Wisconsin

Rapids. For primary bibliographic entry see Field 08C. W72-12333

CAMERON-CREOLE WATERSHED, LOUI-SIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12334

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08A. W72-12335

EAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT

STATEMENT).
Bureau of Reclamation, Boise, Idaho.
For primary bibliographic entry see Field 08A.
W72-12336

LOANS TO BE MADE BY THE FARMERS HOME ADMINISTRATION TO RURAL WATER SYSTEM NO. 1, HOSPERS, IOWA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Farmers Home Administration, Washington, I For primary bibliographic entry see Field 04A W72-12337

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT). neral Services Administration, Washington,

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For primary bibliographic entry see Field 05G. W72-12338

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla. For primary bibliographic entry see Field 08A. W72-12339

CREEK RESERVOIR. CREEK BASIN, PENNSYLVANIA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 08D. W72-12340

BEAVER DRAINAGE DISTRICT, OREGON-PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08C. W72-12341

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 08D. W72-12342

TOO MANY PEOPLE ON THE COLORADO RIVER, Arizona Daily Star, Tucson.

For primary bibliographic entry see Field 05G. W72-12349

07. RESOURCES DATA

7A. Network Design

NATIONAL WATER DATA PROGRAM, Geological Survey, Washington, D.C. Office of Water Data Coordination. O. M. Hackett.

Journal of the American Water Works Association, Vol 58, No 7, p 786-792, July 1966. 8 ref.

Descriptors: *Data processing, *Hydrologic data, *Information retrieval, *Networks, *Data collec-tions, *Planning, Water resources development, Variability, Water Resources Research Act, Water Resources Planning Act, Water Quality Act,

Identifiers: Federal Water Project Recreation Act, *Data inventory, *Data network, *Data needs, *Data system, Information levels, Sampling theory, River basin planning.

The purpose of the national water data network is to meet the needs of federal agencies and others for information on the location, quantity, quality, availability, time variation and use of water resources. Three principal steps are involved: (1) the inventory of existing data and data activities, (2) establishment of data needs, and (3) design of a system to fill these needs efficiently. (Flack-AW-WARF) W72-11892

INHERENT ERRORS IN PERPENDICULAR AL-LOCATION OF OVERLAPPING CHROMATO-GRAPHIC PEAKS, Osaka Univ. (Japan). Dept. of Applied Chemistry. For primary bibliographic entry see Field 02K.

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W72-12168

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR, Michigan State Univ., East Lansing. Dept. of

For primary bibliographic entry see Field 07C. W72-12183

VERIFICATION ERROR IN SINGLE SAM-PLING INSPECTION PLANS FOR PROCESSING SURVEY DATA, Bureau of the Census, Suitland, Md. Statistical For primary bibliographic entry see Field 07C. W72-12184

THE ABSOLUTE SAMPLE SIZE IS WHAT

COUNTS, General Electric Corporate Research and Development, Schenectady, N.Y. G. J. Hahn.

Quality Progress, Vol 5, No 5, p 18-19, May 1972.

Descriptors: *Statistical methods, Mathematical studies, "Quality control, Equations, Sampling, Size, Reliability, Population, Variability.

Identifiers: "Random sampling, Precision, Con-

In random sampling it is more significant to rely upon both the sample result and a confidence in-terval rather than using the sample result as an absolute value. This is true because sampling variation or defects may cause the results to differ from true values. From the statistical equation, the square root of the quantity 1 minus the sample size divided by the population size, it can be seen that precision increases roughly with the square root of the sample size. If the sample is selected randomly from the population, the size of the population is not important unless the sample is an appreciable proportion of it (greater than 10 percent). Therefore it is the absolute size of the sample and not its size relative to that of the population that counts. For example, in a population of 1000 (N sub 1) 10 percent of the sample would contain 100 observations (n sub 1) while in a population of 100,000 (N sub 2) a one percent sample represents 1,000 observations (n sub 2). A shorter confidence level and, therefore, a more precise estimate of the population proportion is obtained from N sub 2. (Mackan-Battelle) W72-12185

CAMP STREAM IHD EXPERIMENTAL BASIN

NO. 12, Ministry of Works, Wellington (New Zealand). Water and Soil Div. For primary bibliographic entry see Field 02E. W72-12374

7B. Data Acquisition

APPLICATION OF WATER TEMPERATURES TO THE PROBLEM OF LATERAL MIXING IN THE GREAT BEAR MACKENZIE RIVER SYSTEM, British Columbia Univ., Vancouver. Dept of

Geography. For primary bibliographic entry see Field 02E. W72-11746

A CAPACITOR-TYPE RAIN GAUGE WITH DC OUTPUT AND IMPROVED FLOW CHARACTERISTICS, Bell Telephone Labs., Inc., Holmdel, N.J. Crawford Hill Lab.

For primary bibliographic entry see Field 02B. W72-11748

REGRESSION UPDATING, Bell Telephone Labs., Inc., Murray Hill, N.J. J. M. Chambers.

Journal of the American Statistical Association, Vol. 66, No. 336, p 744-748, December 1971. 2 tab,

Descriptors: *Statistical models, *Regression analysis, Mathematical studies, Equations, Model studies, Quality control, Mathematical models, Methodology.

Identifiers: *Updating, Accuracy.

Numerically acceptable procedures are provided for adding and deleting rows from a regression model. Whereas the addition of a row is numerically stable, deletions are inherently unstable. The methods and relative accuracies of both procedures are discussed and an example with listings included. (Mackan-Battelle) W72-11799

ADSORPTION-FREE MEASUREMENTS ON STREAMING RADIOACTIVE SOLUTIONS, Chalmers Univ. of Technology, Goteborg (Sweden). Div. of Nuclear Chemistry. For primary bibliographic entry see Field 05A. W72-11803

AN IMPROVED OPTIMUM CONTROL AL-GORITHM FOR A CLASS OF WATER POLLU-TION PROBLEMS, Newark Coll. of Engineering, N.J. For primary bibliographic entry see Field 05G. W72-11807

A SIMPLE ASSEMBLY FOR FREEZE-DRYING

OF TISSUE SAMPLES,
Michigan Univ., Ann Arbor. Upjohn Research
Center for Clinical Pharmacology. F. Medzihradsky. Laboratory Practice, Vol 21, No 2, p 115, Februa-

Descriptors: *Freeze drying, *Laboratory equipment, Equipment, Design, Construction, Bioassay, Freezing, Drying, Instrumentation.
Identifiers: *Sample preparation, *Biological sam-

An arrangement that can be used in preparing low temperature freeze-dried samples can be easily as-sembled from equipment often present in biochemical labs. The requirements are: a low temperature chest, vacuum pump, manifold type freeze-drying pot, vapor trap, and vacuum gauge. Inside the chest, the freeze-drying pot is placed on an elevated stand for convenient attachment to a teflon pipe leading to the outside where a metal 'T-piece provides a side arm of the vacuum line leading to the McLeod gauge. All connections are made using thick wall tygon tubing. The vapor traper and provides a side of the side of and vacuum gauge are placed on a cart with the vacuum pump on the lower shelf. The chest temvacuum pump on the lower shelf. The chest temperature is set to minus 40 degrees C and the temperature gradient is established by placing crushed dry ice into the freeze-drying pot. The vapor trap is filled with dry ice or a dry ice-acetone mixture. The assembly has proved to be efficient, reliable, and convenient. A schematic diagram of this assembly is presented. (Mackan-Battelle)

MINI COMPUTER SYSTEM FOR SHIPBOARD SAMPLING, Oregon State Univ., Corvallis. Dept. of Oceanography. H. Curl, Jr., and P. Becker. Oceanology International, Vol 7, No 1, p 34-36, January 1972.

Descriptors: "Computers, "Sampling, "Ships, "Data collections, "Data storage and retrieval, Instrumentation, Data processing, Electronic equipment, Research equipment, Salinity, Temperature, Reliability, Monitoring, Primary productivity, Biological properties, On-site investigations, Automation.

A compact, reliable, and self-contained on-line data computer system for shipboard sampling con-sists of a PDP 8/L CPU with a random access disc sists of a PDP 8/L CPU with a random access disc file. The major source of data for the system comes from a Bissett-Berman Model 9040 Salini-ty/Temperature/Depth system, modified to pro-vide a fourth channel of data from an optional ex-ternal sensor on the 200-lb 'fish'. The 'fish' also is calibrated to only 200 m, the area of biological in-terest. Since chemical parameters are measured in some types of biological work, a Technicon Auto-Analyzer is to be interfaced directly to the CPU. Analyzer is to be interfaced directly to the CPU. Water for the analyzer comes from the fish location via a submerged pump and hose. All subsurface data are conveyed by a hose/cable which provides power to the fish and the pump, and transmits water and S/I/D FM analog signals to the deck. The hose/cable is handled by a power-block/storage drum system. This system is patterned after tuna seine net handling gear with control of the cable centered in a remotely located power block. This system is electric/hydraulic powered to provide maximum speed control with optimal power availability; modification for online CPU control at a later time also is simplified. A strap-in seat for hands-free operation is included as well as a voice data logging channel for comments and notes. Primary inputs to the CPU are via one or two 16-channel A/D multiplexers and an ASR 33 teletype/paper-tape punch/reader. With a channel-to-channel sampling time of 30 microseconds maximum, virtually simultaneous monitoring of all data channels is possible. Long-tenure benefits are reflected in prediction and estimation of biological productivity which aid in long-term studies of the relationships between fish catch and primary productivity. (Snyder-Battelle) W72-11841 Water for the analyzer comes from the fish loca-

A BASKET FOR WASHING BENTHOLOGICAL SAMPLES, Fish and Wildlife Service Ashland, Wis. J. H. Selgeby. Transactions of the American Fisheries Society, Vol 100, No 3, p 590-591, July 1971. 2 fig.

Descriptors: "Bioindicators, Apparatus, "Benthic fauna, Methodology, Pollutant identification, Fil-ters, Oligochaetes, Diptera, Bottom sampling. Identifiers: "Washing basket, "Benthological sam-

An apparatus is described for washing benthological samples without damaging delicate organisms and with a significant reduction in time required. (Katz-Washington) W72.1180

USE OF A MAGNETIC TAPE CASSETTE RECORDER WITH AN ON-LINE GC DATA

Eastman Kodak Co., Rochester, N. Y. Industrial

J. T. Frazer, and B. T. Guran. Journal of Chromatographic Science, Vol. 9, no. 12, p 718-721, December 1971. 8 fig, 1 ref.

Descriptors: *Data storage and retrieval, Instru-mentation, Computers, *Gas chromatography, Data transmission, Laboratory equipment.

Field 07—RESOURCES DATA

Group 7B—Data Acquisition

Identifiers: *Tape recorders, Cassette tape recor-

By interfacing a cassette tape recorder with an online gas chromatography data system, an economi-cal extension of the system's capability has been provided. The hardware interface allows the cassette to function under control of the priority interrupt system in the computer. The software written allows storage of GC report data on cassette, and retrieval of that data for further processing by background programs. Use of the cassette to obtain summary reports of GC data, and as a means for storage and retrieval of system programs is described. (Mackan-Battelle)

A NEW COMPUTING INTEGRATOR FOR

CHROMATOGRAPHY, Vidar Corp., Mountain View, Calif. J. D. Hettinger, J. R. Hubbard, J. M. Gill, and L.

Journal of Chromatographic Science, Vol. 9, No. 12, p 710-717, December 1971. 16 fig, 4 ref.

Descriptors: *Chromatography, *Automation, *Data processing, Analytical techniques, Computers, Digital computers, Instrumentation, Data storage and retrieval, Equipment, Laboratory equipment.

Identifier: Computing integrator, Sensitivity.

The concept of a new Computing Integator for Chromatography is described. The computing integrator is a firmware driven digital system incorporating the latest innovations in solid-state memories and computer architecture. Up to four chromatographs can be automated simultaneously. The analog signals from each chromatograph are digitized in channel modules so that transmission to and multiplexing within the processor are both digital. Operating parameters are also input in digital form. The random-access and read-onlymemories in the processor and the digital data make possible nonhorizontal baseline corrections, tangential peak splitting, maintenance of optimum peak and baseline detection sensitivity and noise rejection, and post run calculations. Compared with digital integrators the computing integrator has better peak detection and noise rejection because run parameters are always at the optimum value, and memory allows data scooping. Memory also allows versatile baseline correction techniques. There is also capability for result calculation and method storage. Compared with computer-based data systems, the computing integrator has better noise suppression because of the digital transmission and digital multiplexing. It can be easily installed with any chromatograph, and no electrometer cleanup is required. It is very easy to operate because all run parameters are digital and in chromatographic terms. Entry and maintenance cost are significantly lower. (Mortland-Battelle) W72-11932

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES,

For primary bibliographic entry see Field 02F. W72-12023

PRECIPITATION MEASUREMENT PARADOX-THE INSTRUMENT ACCURACY PROBLEM,

For primary bibliographic entry see Field 02B. W72-12032

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INTERPRETATION OF AERIAL PHOTO-CDADHS FOR GEOMORPHOLOGICAL RESEARCH.

bibliographic entry see Field 07C. W72-12036

A DEVICE FOR SAMPLING IMMEDIATELY ABOVE THE SEDIMENT-WATER INTERFACE, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 02J. W72-12299

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND.

NEW YORK, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W72-12373

APPLICATION OF THE FINITE ELEMENT METHOD TO REGIONAL WATER TRANS-PORT PHENOMENA, Alaska Univ., College. Inst. of Water Resources.

For primary bibliographic entry see Field 05B. W72-12381

7C. Evaluation, Processing and Publication

STATISTICAL PROCESSING OF LONG-TERM OBSERVATIONS OF GROUNDWATERS, Ceskoslovenska Akademie Ved, Geograficky Ustav. For primary bibliographic entry see Field 02F. W72-11744

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Oregon, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperatures, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.

Identifiers: *Cooperative water-studies program,

Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Oregon are summarized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 361 pri-The hydrologic data network consists of 361 primary, secondary, and water management streamflow stations; 844 groundwater observation wells; and 96 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual precipitation, and average annual runoff. A map, scale 40 mit to the inch shows by symbols, numbers, and colored avulties the hydrologic data net bers, and colored outline the hydrologic data network and investigations in Oregon in June 1968. (Woodard-USGS) W72-11750

OBJECTIVE CRITERIA FOR THE EVALUA-TION OF CLUSTERING METHODS, Massachusetts Inst. of Tech., Cambridge.

W. M. Rand.

Journal of the American Statistical Association, Vol. 66, No. 336, p 846-850, December 1971. 5 tab,

Descriptors: *Statistical methods, Approximation method, Numerical analysis, Monte Carlo method, Data collections, Quality control, Sampling. Identifiers: *Clustering methods, *Performance

evaluation, Sensitivity.

There have been many approaches to the problem of clustering data, however, lack of objective criteria has made interpretation of their results dif-ficult. Several criteria care record Several criteria are proposed to isola specific aspects of method performance. These include retrieval of 'natural' clusters, sensitivity to resampling (perturbation), and stability in the presence of new data. These criteria depend on a measure of likeness between two different clusterings of the same set of data; the measure essentially considers how each pair of data points in assigned in each clustering. (Long-Battelle) W7

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AN IMPROVED OPTIMUM CONTROL AL-GORITHM FOR A CLASS OF WATER POLLU-TION PROBLEMS, Newark Coll. of Engineering, N.J. For primary bibliographic entry see Field 05G. W72-11807

MINI COMPUTER SYSTEM FOR SHIPBOARD SAMPLING. Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 07B.
W72-11841

WATER RESOURCE OBSERVATORY CLI-MATOLOGICAL DATA - WATER YEAR 1971. Wyoming Univ., Laramie. Research Inst. Water Resources

Available from the National Technical Informa-tion Service as PB-211 082, \$6.00 paper copy, \$0.95 in microfiche. Water Resources Series No. 27, March 1972. 301 p. OWRR A-001-WYO (54).

Descriptors: *Humidity, *Temperature, Computer programs, *Data collections, *Data processing, *Climatological data, *Wyoming.

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and non-record-ing precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800 and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. The card format and computer program are presented in WyoWRRI Water Resources Series No. 8.

NATIONAL WATER DATA PROGRAM, Geological Survey, Washington, D.C. Office of Water Data Coordination. For primary bibliographic entry see Field 07A.

QUANTITATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 04A.

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED Geological Survey, Wash., D.C. Water Resources

For primary bibliographic entry see Field 03D. W72-11905

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE. Geological Survey, Nashville, Tenn.

W72-11978

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ADEQUACY OF HYDROLOGIC RECORDS FOR PARAMETER ESTIMATION, Kentucky Univ., Lexington. Dept. of Agricultural

neering.

Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9128, p 1387-1393, August 1972. 4 tab, 5 ref, ap-

Descriptors: *Data collections, *Simulation analy-sis, *Stochastic processes, *Monte Carlo method, *Statistical models, Mathematical models, Proba-

bility. Identifiers: Error analysis.

Monte Carlo simulation can be used to determine the probability of errors of various magnitudes produced by stochastic models and how these error probabilities change as the number of observations used in determining the parameters of the stochastic model change. The simulation technique is simple, easy to apply and produces results that are easy to interpret. The step-by-step procedure is outlined. A stochastic model of monthly streamflow is used to illustrate the procedure and demonstrate that a table of error probabilities as a function of the number of obser-Monte Carlo simulation can be used to determine probabilities as a function of the number of obser-vations available can be produced. (Knapp-USGS)

PARAMETER ESTIMATION FOR FIRST-ORDER AUTOREGRESSIVE MODEL, Instituto Geografico Nacional, Guatemala City. For primary bibliographic entry see Field 02E. W72-11999

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *South Carolina, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Sediment transport, On-site investigations, Water quality, Water temperatures, Water level fluctuations, Bibliographies, Network, Maps. Identifiers: *Cooperative water-studies program, Research projects.

Research projects.

Water resources studies and investigations of the U.S. Geological Survey in South Carolina are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 82 prima-The hydrologic data network consists of 82 primary, secondary, and water management streamflow stations; 111 groundwater observation wells; and 17 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, long term water-table changes and discharge of the principal rivers. A map, scale 23 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in the hydrologic data network and investigations in South Carolina in October 1968. (Woodard-USGS) W72-12001

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Oklahoma, *Inter-agency cooperation, Surface

waters, Groundwater, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Sediment transport, Water tempera-ture, On-site investigations, Precipitation (At-mospheric), Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Net-works, Maps. Identifiers: *Cooperative water-studies program,

Research projects.

Water resources studies and investigations of the U. S. Geological Survey in Oklahoma are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 160 primary, secondary, and water management streamflow stations; 254 groundwater observation wells; and 35 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the chemical quality of the rivers. A map, scale 35 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Oklahoma in July 1968. (Woodard-USGS) W7Z-12002

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968.

Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Ohio, *Inter-agency cooperation, Surface waters, Surveys, Groundwater, Planning, Hydrologic data, Basic data collections, Precipita-Hydrologic data, Basic data collections, Precipita-tion (Atmospheric), Runoff, Streamflow, Sedi-ment transport, On-site investigations, Water quality, Water temperature, Dissolved solids, Water level fluctuations, Bibliographies, Net-works, Maps. Identifiers: *Cooperative water-studies program,

Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Ohio are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 176 primary, secondary, and water management streamflow stations; 240 groundwater observation wells; and 89 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 42 mi othe inch, shows by symbols, numbers, and to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Ohio in September 1968. investigations in (Woodard-USGS) W72-12003

WATER RESOURCES OBSERVATORY STREAMFLOW DATA - WATER YEARS 1965 THROUGH 1971,

Wyoming Univ., Laramie. Water Resources Research Inst.

L. E. Allen, and V. E. Smith.

L. E. Auen, and V. E. Smith. Available from the National Technical Informa-tion Service as PB-211 126, \$3.00 in paper copy, \$0.95 in microfiche. Wyoming Water Resources Series No 28, May 1972. 92 p. OWRR-A-001-Wyo

Descriptors: *On-site data collections, *Hydrologic data networks, *Streamflow, Data processing, *Wyoming.

Data from water level recorders and rated stream sections are presented for stations operated by the Wyoming Water Resources Research Institute. The reduced data are processed through the University of Wyoming's digital computer. Program output presented includes station identification, mean daily flows in second-feet, total monthly flows in second-feet, monthly flows in second-feet monthly discharges; in acromonthly flows in second-foot-days, mean monthly flows in second feet, monthly discharges in acrefect, and annual flow in acre-feet for each water year. The stream gaging network is primarily on the drainages of Nash Fork and Libby Creeks, tributaries of the Little Laramie River; the Medicine Bow River and certain of its tributaries; and on the Laramie River irrigation diversions therefrom north of Laramie, Wyoming. The latter area is supplemented by USGS stations above the below the study area. The streamflow gages have been located to measure the runoff pattern from high mountain watersheds, as well as to provide measurements for inflow-outflow studies of agricultural consumptive use.

INTERPRETATION OF AERIAL PHOTO-GRAPHS FOR GEOMORPHOLOGICAL GRAPHS FOR RESEARCH, Ye. N. Azbukin

Ye. N. Azbukina.

Trans. available from the National Technical Information Service as NASA TTF-624, \$3.00 in paper copy, \$0.95 in microfiche. National Aeronautics and Space Administration Technical Translation NASA TT F-624, April 1972. 79 p, 22 fig, 16 ref, 3 append. (Translation of Deshifrirovaniye Aerofotosnimkov dlya Geomorfologicheskikh Issledovaniy, Leningrad University Press, Leningrad, 1969.).

Descriptors: *Aerial photography, *Terrain analysis, *Photogrammetry, *Mapping, *Geomorphology, Data collections, Erosion, Topography. Identifiers: *USSR.

This monograph describes the application of aerial photograph interpretation in field and office geomorphological research and photo interpretageomorphological research and photo interpreta-tion for describing relief types and forms, their origin, and interrelationships with geological struc-ture. Aerial photographs of relief forms illustrate the various landscape conditions in different re-gions of the Soviet Union. (Knapp-USGS) W72-12036

SUBMERSIBLE WATER QUALITY MONITOR-ING EQUIPMENT, Water Pollution Research Lab., Stevenage (En-

gland). For primary bibliographic entry see Field 05A. W72-12058

GEOPHYSICAL MAPPING OF THE WATER TABLE IN EOCENE SEDIMENTS: FEASIBILITY AND RELIABILITY EVALUATION, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 02F. W72-12104

THE RIVER BASIN MODEL: ASSESSMENT DE-

Environmetrics, Inc., Washington, D.C. For primary bibliographic entry see Field 04A. W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT. Envirometrics, Inc., Washington, D.C. For primary bibliographic entry see Field 04A.

Field 07-RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

THE RIVER BASIN MODEL: THE TRANSPOR-TATION SECTIOR.
Envirometrics, Inc., Washington, D.C.

For primary bibliographic entry see Field 04A.

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR, Michigan State Univ., East Lansing. Dept. of

J. Ramsey, and R. Gilbert.

Journal of the American Statistical Association. Vol 67, No 337, p 180-186, March 1972. 4 tab, 31

Descriptors: *Monte Carlo Method, *Specifications, Statistical methods, Model studies, Mathematical models, *Quality control, Testing, Sampling, Least squares method, *Data processing. Identifiers: *Errors.

Tests for the specification errors of omitted variables, incorrect functional form, simultaneous equation problems, and heteroskedasticity previously developed by the author are further conously developed by the author are further con-sidered. Regression, Rank, and Bartlett's M Specification Error Tests are discussed and specification of the models used in the Monte Carlo experiments provided. Monte Carlo methods are used to examine the statistical inde pendence of the test statistics, the small sample power of the tests under various alternatives, and the effect on the tests of using ordinary least squares instead of Theil residuals. (Snyder-Bat-telle) W72-12183

VERIFICATION ERROR IN SINGLE SAM-PLING INSPECTION PLANS FOR PLING INSPECTION PLANS FOR PROCESSING SURVEY DATA, Bureau of the Census, Suitland, Md. Statistical

Research Div.

Journal of the American Statistical Association, Vol 67, No 337, p 46-54, March 1972. 3 fig, 5 tab,

Descriptors: *Sampling, *Inspection, *Surveys, *Data processing, Statistical methods, *Quality control, Mathematical studies, Equations, Measurement, Evaluation, Standards. Identifiers: *Errors.

Measurement and verification errors seriously affect the quality of processing survey data. Formulas are provided to assess the effect of inefficient inspection and correction on the power of the sampling plan to distinguish between acceptable and unacceptable quality levels, on average outgoing quality, and on costs. Emphasis is placed on the error of classifying defectives as nondefectives (Type II) made by both inspectors (called 'verifiers') of sample items and by correctors of items in rejected lots. Type I errors are considered for conditions peculiar to preparing data for machine processing in which nondefective items are regarded as defectives and changed to incorrect ones. (Snyder-Battelle) W72-12184

TRITIUM CONTAMINATION OF THE EN-VIRONMENT (UBER DIE TRITIUMKON-TAMINATION DER UMWELT), Kernforschungszentrum, Karlsruhe (West Ger-

many)

L. A. Koenig, and M. Winter. Paper presented at the Commission of the Europe-an Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 14 p, 4 Descriptors: *Tritium, *Water quality control, *Monitoring, *Nuclear wastes, Radioactivity, Effluents, Nuclear powerplants, Radioecology, Water analysis, Radioactivity techniques, Water pollution sources, Pollutant identification, Meteoric water, *Path of pollutants.

Tritium uptake by man should be monitored to maintain surface and groundwater quality, especially in view of the possible future development of fusion reactors. Measurement without prior concentration is recommended and described (the 'Insta-Gel' cocktail, internal scintillant). Since tritium in air is largely in the form of tritiated water, in this case sampling by collection on a cold finger is recommended. The authors' results for surface-, ground-, and rainwater are compared with those of others. Concentrations ranged from 0.4-1.4 pCi/ml, and the average dose to man was about 0.1 mrem/year. Although the air moisture in certain Karlsruhe laboratories reached greater than 3pCi/ml, the maximum dose from this source was about 0.01 mrem/year. (Most of the dose is from world wide contamination from nuclear testing.) (Bopp-ORNL) W72-12195

OPTIMIZATION TECHNIQUES.

Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06A. W72-12227

APPLICATIONS OF LINEAR PROGRAMMING. OR LINEAR POTPOURRI, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 06A. W72-12230

LINEAR PROGRAMMING: GENERAL CON-CEPTS AND METHODS,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A. W72-12231

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS, Illinois Univ., Urbana. Dept. of Civil Engineering.

For primary bibliographic entry see Field 06A. W72-12233

NONLINEAR PROGRAMMING AND SEN-SITIVITY ANALYSIS, Pennsylvania State Univ., University Park. Dept.

of Civil Engineering.
For primary bibliographic entry see Field 06A. W72-12235

MODEL HYDROGRAPHS,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02A. W72-12376

APPLICATION OF HARRILL'S EQUATION TO A LIMESTONE AQUIFER, New Mexico Inst. of Mining and Technology,

Socorro. For primary bibliographic entry see Field 02F. W72-12380

08. ENGINEERING WORKS

8A. Structures

AZOTEA TUNNEL INSTRUMENTATION PROGRAM, SAN JUAN-CHAMA PROJECT, NEW MEXICO,

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u of Reclamation, Denver, Colo. W. H. Ortel.

Bureau of Reclamation Report REC-ERC-71-49, Dec 1971. 41 p, 7 fig, 3 dwg, 2 tab, 26 chart, 2 ref,

Descriptors: "Tunnel linings, "In situ tests, "Instrumentation, "Movement, Rocks, Rock mechanics, Joints (Geology), Tunnel design, Geology, Sedimentary rocks, Engineering geology, Expansive clays, On-site tests, Measurement, Extensometers, Tunnels. Identifiers: "Concrete linings, Shotcrete, Test results, Rock slope stability, Azotea Tunnel (N Mex), San Juan-Chama Project, Colorado River Storage Project.

Storage Project.

An instrumentation program for Azotea Tunnel, San Juan-Chama Project, was developed to evaluate tunnel stability. The program included rock movement measurements, concrete lining measurements, and a lining per formance test. No rock movement pattern relating to the overburden, rock type, or jointing could be detected. Large movements occurred where local fallout was common. At depths of 800 ft or more, horizontal and vertical diameters converged; at lesser depths, an elliptical shape developed with the vertical diameters con-verging and the horizontal diameters diverging. The concrete lining instrumentation sho concrete shrinkage away from the rock and defor-mation of the lining into a slightly elliptical shape. Except in the shotcreted section, the joint meters indicated the rock was placing a load on the lining. Strain meters measured the strain induced by the rock. From the strains, the concrete stresses could be computed. Results from the shotcreted section suggest that the shotcrete protected the shale and prevented changes in the stability of the rock mass. The lining performance test showed the expansive characteristics of the shale and their effect on the lining. Pressures developed in the shale were sufficiently high to cause cracking and relalarge movements in the concrete lining. (USBR) W72-11787

USING SOIL MECHANICS IN OCEAN EN-GINEERING, Dames and Moore, Los Angeles, Calif.

Oceanology, Vol. 7, No. 2, p. 29-33, Feb 1972. 6 photo, 2 tab.

Descriptors: *Foundations, *Construction, Soil mechanics, Ocean bottom, Piles (Foundations), Offshore platforms, Fills, Islands, Settlement (Structural), Slope stability, Sampling, Trafficability, Oceanography, Surveying, Airports. Identifiers: *Underwater foundations, *Underwater construction, Liquefaction, Piston samplers, Sediment sampling, Submarine cables, Sediment pipelines, Offshore structures, Underwater structures, Underwater aqueduct (Collective).

Soil mechanics problems encountered in ocean-resoli mechanica proteins encountered in ocean-related engineering projects are as varied as those encountered onshore. Typical oceanic soil problems include: (1) design and installation of piles for offshore platforms or bulkheads; (2) design and installation of pipelines and their anchorages; (3) design and construction of fills for originate size of the design and construction of fills for originate size of the design and construction of fills for the construction of the construct anchorages; (3) design and construction of this total airports, islands, and additional port storage; (4) analysis of slope stability of navigation channels and pipeline trenches; (5) analysis of scour poten-tial around piles and bridge piers; (6) assessment of sea floor trafficability for ocean construction and mining vehicles; and (7) analysis of possible effects of undersea earthquakes. Predicting the bearing capacity of a pile 4 ft in dia. and 35 times heavier than an average size pile is a challenging oceanic soils problem. Profiles of the ocean floor can be determined using high-frequency reflection techniques. The least disturbed soft soil samples have been recovered using an actuated piston-type sampler. Understanding the geological factors that created the soil conditions of a site is very helpful to offshore soils engineers. (USBR) W72-11791

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HURRICANE FLOOD PROTECTION AND BEACH EROSION CONTROL PROJECT REVOLVING FUND. For primary bibliographic entry see Field 06E. W72-11944

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Seattle, Wash.

Available from the National Technical Informa-tion Service as PB-200 798F, \$3.00 in paper copy, \$0.95 in microfiche. September 15, 1971. 46 p, 1

Descriptors: "River basin development, "Flood control, "Water supply, "Dam construction, Water allocation (Policy), Recreation, "Washington, Multiple-purpose projects, Water resources development, Watershed management, Irrigation water, Industrial use (Water), Domestic water, Wildlife habitats, Aquatic habitats, Fish management, Water requirements. Identifiers: "Environmental Impact Statements, "Grays Harbor (Wash).

*Grays Harbor (Wash).

The Wynoochee Project in Grays Harbor County of southwestern Washington involves construction of a multipurpose concrete gravity dam. The Wynoochee River originates as a precipitous stream on the southern slopes of the Olympic Mountains. Wynoochee Lake will provide 35,000 acre-feet of water storage for flood control and assure a 385 c.f.s. flow during low flow period for fishery enhancement and irrigation and for diversion by the city of Aberdeen for industrial and domestic use. Adverse environmental effects include the loss of 5.4 miles of resident stream fish habitat and anadromous trout spawning and rearing area; inundation of 1,140 acres of big game habitat; loss of timber, other vegetation and habitat for wildlife other than big game; and the appearance of buildings in a former wild valley. The only known alternative at this time would be abandonment of the project. The project is in accord with the projected demand for water and land in this area for recreation, agriculture, commercial fishery production, and industry in Aberdeen. Comment has been solicited and received from appropriate federal, state, and local agencies. (Waldron-Florida)

T OR C-WILLIAMSBURG ARROYOS WATERSHED, NEW MEXICO (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. Watershed Planning Div.

Available from the National Technical Informa-tion Service as PB-204 090D, \$3.00 in paper copy, \$0.95 in microfiche. November 8, 1971. 9 p, 2 fig.

Descriptors: *New Mexico, *Environmental effects, *Flood control, *Watershed management, Flood plains, Erosion control, Flood protection, Sediment yield, Administrative decisions, Multiple-purpose projects, Comprehensive planning, Channel improvement, Rio Grande River, Land development, Floodways, Pipelines, Retardants, Flood frequency.

Identifiers: *Environmental Impact Statements, *Williamsburg Arroyos Watershed (N.M.).

This watershed project will reduce floodwater and sediment damage to urban and agricultural land in and near Truth or Consequences and Williamsburg, New Mexico. The plan includes conservation land treatment, four floodwater retarding structures, channel and pipeline, and about 0.6 mile of floodway. The project will reduce erosion, reduce sediment carried by the Rio Grande, reduce floodwater and sediment damages by about 98%, protect homes and commercial properties from a 1% chance storm event, reduce mosquito breeding places, protect municipal water wells from flood damage, and permit development of flood plains for homes and businesses. Adverse environmental effects include the elimination of agricultural use and wildlife habitat on land to be used for dams and spillways; temporary interrupagricultural use and wildlife habitat on land to be used for dams and spillways; temporary interruption of agricultural and wildlife use of rangeland in the sediment and detention pools of planned structural measures; and relocation of one home, powerline, ranch road and street. Alternatives considered include conservation land treatment alone, flood proofing of existing improvements and zoning undeveloped areas, public land acquisitions of flood-prone areas, and continuing present flood plain use and trends. (Widman-Florida) W72-11952

SMALL BOAT HARBOR ON THE SOUTH SHORE OF LAKE ONTARIO AT OAK ORCHARD HARBOR, NEW YORK (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y.

Available from the National Technical Informa-tion Service as PB-199 636D, \$3.00 in paper copy, \$0.95 in microfiche. May 26, 1971. 7 p, 2 map.

Descriptors: "Environmental effects, "Break-waters, "Jetties, "Lake Ontario, "Dredging, Recreation, Safety, Channel improvement, Fish establishment, Fish stocking, Turbidity, Currents (Water), Harbors, Economic feasibility, Adminis-trative agencies, "New York. Identifiers: "Environmental Impact Statements, "Oak Orchard Harbor (N.Y.).

This project would provide for construction of a small-boat harbor on the south shore of Lake Ontario, New York. The project calls for construction of parallel jetties, an off-shore detached breakwater, and dredging of an entrance channel. It also provides for installation of recreational fishing facilities on the jetties. The project would result in temporary loss of some 10 acres of bottom biota and increased turbidity during construction. The construction of a small-boat harbor at any other location would be more costly and would have at least an equally adverse environmental impact. To abandon the project would not provide the needed safe harbor and would forego about \$80,000 in net benefits. The project will not have any significant impact on the long-term productivity of the area. (Waldron-Florida)

MYERS CHUCK HARBOR, MYERS CHUCK, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Anchorage, Alaska

Available from the National Technical Informa-tion Service as PB-199 638D, \$3.00 in paper copy, \$0.95 in microfiche. May 28, 1971. 11 p, 1 map.

Descriptors: *Alaska, *Environmental effects, *Harbors, *Breakwaters, Tidal effects, Economic feasibility, Administrative agencies, Project planning, Clams, Aquatic productivity, Fish management, Coastal structures, Barriers, Sea walls, Concrete structures. Identifiers: *Environmental Impact Statements, *Myers Chuck (Alas).

Myers Chuck is a small natural harbor located on the eastern shore of Clarence Strait in southeastern Alaska. The presently authorized project would consist of a breakwater 700 feet long which would result in closing the southern entrance of the harbor. The project would provide a harbor of refuge for fish and enhance the economy of the local community. There would be a loss of about 900 square yards of clam habitat and a decrease in tidal circulation. There would also be an increased possibility of harbor icing and accumulation of debris. A long-term loss of productivity will occur as a result of removing clam bed habitat from production. The only alternatives to the proposed project would be no project at all or construction of the breakwater at a different site. The project would result in an irretrievable loss of clams and an irretrievable expenditure of manpower. (Waldron-Florida)

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-206 620F, \$3.00 in paper copy, \$0.95 in microfiche. February 1972, 31 p, 2 map, 2

Descriptors: *South Dakota, *Environmental effects, *Conservation, *Flood protection, *Channel improvement, Watershed management, Stabilization, Multiple-purpose projects, Erosion control, Sedimentation, Administrative agencies, Water management (Applied), Retardance, Land management, Land development. Identifiers: *Environmental Impact Statements, *Union Creek (S.D.).

The project proposes conservation land treatment measures and four floodwater retarding structures, 13 grade stabilization structures, and 1.6 miles of channel improvement in Union County, South Dakota. The project will reduce erosion rates and protect 4,800 acres of upland from land destruction and depreciation. Floodwater and sediment damages will be reduced by 80 percent. The sediment entering Lake Nixon will be reduced 18,700 tons annually and the sediment leaving the watershed will be reduced 80 percent. The floodwater retarding and grade stabilization pools provide recreational opportunities and increase the habitat for waterflow and aquatic furbearers. Increased and improved vegetative cover will proreased and improved vegetative cover will pro-vide more and better upland wildlife cover. Ad-verse environmental effects include inundation of about 5 miles of intermittent stream channel, 40 about 5 miles of intermittent stream channel, 40 acres of cropland, and 55 acres of grassland. Agricultural and wildlife use will be periodically interrupted in the floodwater detention pools. The use of 50 acres of land in dams, spillways, and grade stabilization structures will be temporarily lost to agriculture and wildlife until the areas are re-vegetated. Many alternatives were considered, but were considered unacceptable. (Widman-Florida) W72-11959 W72-11958

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W.Va.

Available from the National Technical Informa-tion Service as PB-200 949D, \$3.00 in paper copy, \$0.95 in microfiche. March 29, 1971. 13 p.

Descriptors: "Ohio, "Environmental effects, "Dam construction, "Flood control, Water quality control, Recreation facilities, sedimentation, Al-ternate planning, Administrative agencies, Multi-ple-purpose projects, Planning, Flood protection, Project planning, Water quality control, Storage, Reservoirs.

Field 08-ENGINEERING WORKS

Group 8A—Structures

entifiers: *Environmental Impact Statements, *Mill Creek Lake, Ohio.

The project involves construction and operation of The project involves construction and operation of a dam and other facilities for flood control, recreation, and water quality control on Mill Creek in Delaware County, Ohio. Environmental impacts include regulation of downstream flow, conversion of stream and upland to a lake, entrapment of sediment, and change of land use in the lake area. Adverse environmental effects include loss of farm lands and some aquatic and terrestrial habitat and relocation of persons now occupying and using the lands to be acquired. Alternatives include developments or combinations of developments such as other reservoirs with storage capacity for similar services, local flood protection works, non-structural flood damage controls, recreational development of the stream and nearby lands, or controls, recreational development of the stream and nearby lands, or creating and prospective development, and no action. Irretrievably lost will be a reach of the natural stream, the land which will be inundated, and any archeological and historic records not recovered prior to filling of the pool. (Widman-Florida) a dam and other facilities for flood control, recre (Widman-Florida) W72-11959

PLASTIC PIPELINES FOR LIVES WATER IN NORTHWEST NEBRASKA, Soil Conservation Service, Rushville, Nebr. LIVESTOCK For primary bibliographic entry see Field 04A. W72-12082

HYDRAULIC STRUCTURE FOR RESISTING WAVE ACTION, J. Stolk, Jr. and J. H. Stolk

U.S. Patent No. 3,548,600, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1349, December 22, 1970.

Descriptors: *Patents, *Shore protection, *Beach erosion, Coasts, Hydraulic structures, Waves (Water), *Embankments.

This hydraulic structure comprises an embankment having thereon a heap of concrete blocks, each of which is a six-sided quandrangular prism. Each edge of each block is at least one meter in length and not more than 10 per cent longer than any other edge of the block. Each side of each block has therein at least one opening the area of which is at least 1 per cent of the total area of the side, the total area of the openings in each side being from 4 to 10 per cent of the total area of the being from 4 to 10 per cent of the total area of the side. Leading inward from each opening is a passage which has a substantially uniform cross-sectional area equal to the area of the opening, and which is connected to a passage leading inward from the opposite side and to passages leading inward from at least some of the adjacent sides of the block. The weight of each block is at least 70 per cent of the weight of a solid block of the same size, and the blocks are dropped at random in the heap with the sides of different blocks facing in different directions. (Sinha-OEIS) W72-12128

TULATIN PROJECT, OREGON (DR.FT EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-199 327D, \$3.00 in paper copy, \$0.95 in microfiche. May 24, 1971. 35 p, 1 map.

Descriptors: *River basin development, control, *Multiple-purpose reservoirs, *Environ-mental effects, Water demand, Water storage, *Oregon, Administrative agencies, Fish conservation, Recreation, Water resources development, Multiple-purpose projects, Fish management, Land resources, Economic feasibility, Storage Identifiers: *Environmental Impact Statements, *Tulatin River (Ore).

Present streamflow in the Tulatin River is inadequate to meet constantly increasing seas water requirements and for the preservation of fish life in the river. The plan of development will provide regulatory storage in Scroggins Reservoir and provide flood control and increased recreational and fishery development. Development of the multipurpose project will improve the socioeconomic environment through a more effi-cient use of the water and related land resources. The project will be an integral part of the future development of other basin resources. Some of the existing beauty of the Scroggins Reservoir area will be lost by inundation but the creation of a stillwater recreation area in this setting will result in a scenic landscape with values of its own. There are no known alternative means of utilizing the land and water resources that would provide equivalent economic, social, and environmental benefits at comparable costs. (Waldron-Florida) W72-12331

CAMERON-CREOLE WATERSHED, LOUI-SIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-202 446F, \$3.00 in paper copy, \$0.95 in microfiche. February 22, 1972. 73 p.

Descriptors: *Louisiana, *Environmental effects, *Flood protection, *Levees, *Channel improvement, Watershed management, Alternate planning, Coordination, Comprehensive planning, Adoption of practices, Multiple-purpose projects, Water distribution (Applied), Water management (Applied), Project planning, Project purposes, Nutrients.

Identifiers: *Environmental Impact State *Cameron-Creole Watershed (Louisiana).

This project would include 19 miles of levee, 35 miles of channels, and 6 water control structures in the Cameron-Creole Watershed, Louisiana. The proposed structural and land treatment measures will provide flood protection. Management of water control structures will prevent future deteri-oration of marsh and improve the vegetative condition. Water control structures will be designed and managed to allow the passage of marine organ-isms, shrimp, and fish into and out of marsh nursery areas, maintain optimum water levels and control salinity ranges. Channel improvement will provide outlets for removal of excess water during periods of high rainfall and for improved distribution of water for beneficial purposes. The modified plan will not achieve the nutrient and organism exchange that now occurs; however, water circulation will improve. An additional 11,300 acres will be available to estuarine forms during normal water conditions. Alligatorweed is expected to increase and may interfere with boat travel. Some competition may develop between waterfow (geese) and cattle for some species of vegetation. Alternatives include land treatment only, construction of a sill or lock in the Calcasieu River, levee around private land and no action. (Widman-Florida) W72-12334

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-201 518F, \$3.00 in paper copy, \$0.95 in microfiche. October 1971. 50 p, 2 map, 6 Descriptors: *Environmental effects, *Missouri, *Flood control, *Dam construction, Multiple-purpose projects, Channel improvement, River basins, River basin development, Recreation, Fish conservation, Wildlife conservation, Water supply, Water quality control, Area redevelopment, Land use, Non-structural alternatives, Wildlife habitats. ment, Land u dlife habitats.

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Identifiers: *Environmental Impact Statements, *Macon (Missouri), *Long Branch Lake (Missou-

The Long Branch Lake project was authorized by the Flood Control Act of 1965 and is now in preconstruction planning. The project was authorized to include flood control, water supply, recreation, fish and wildlife conservation, and recreation, fish and wildlife conservation, and water quality control in the Little Chariton River basin. Significant channelization has already been basin. Significant channelization has already been carried out in the lower basin to reduce flooding. The completed project will encourage intensified agricultural practices downstream and residential and commercial development. The lake will inundate 2,430 acres of land, eliminate 20 miles of river and associated habitat, and adversely affect forest cover and fish and wildlife habitat. Alternatives to the project include alternative lake sites, small impoundments in upstream areas, nonstructural mea-sures, channelization, and no action. The shortchamicization, and no action. The short-term uses engendered by the project would enhance the long-term productivity of the basin. Comment was solicited and received from ap-propriate federal, state and private agencies. (Wal-ton-Florida)

EAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Bureau of Reclamation, Boise, Idaho.

Available from the National Technical Information Service as PB-205 351D, \$3.00 in paper copy, \$0.95 in microfiche. December 22, 1971. 19 p, 1

Descriptors: *Environmental effects, *Irrigation programs, *Wells, *Pumping plants, Pipelines, Water demand, Domestic water, Idaho, Recreawater demand, Domestic water, Idano, Recrea-tion, Fishing, Multiple-purpose projects, Reser-voir storage, Water supply, Irrigation, Rural areas, Land use, Groundwater, Water pollution control, Fish conservation, Wildife conservation. Identifiers: *Environmental Impact Statements, *Kootenai County (Ida).

The East Greenacres Unit is located in Kootenai, Idaho, and its principal features would include construction of wells and pumps to provide a water supply for irrigation, domestic and livestock uses; construction of a buried pipe distribution system to deliver water to users within the district; and development of two additional public recrea-tion access sites. As a result of the irrigation development contemplated by the project, the existing socio-economic base of the area will improve substantially. Adverse environmental effects include loss of 16 acres of agricultural land required for rights-of-way for pumping complexes, short-term alteration of existing ecology due to construction activities, and some visual impact of storage tanks. Alternatives to the proposed project include no project, rehabilitation of the existing distribution system and supplemental groundwater pumping. (Waldron-Florida) W72-12336

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Tulsa, Okla.

Available from the National Technical Informa-tion Service as PB-200 810D, \$3.00 in paper copy, \$0.95 in microfiche. May 4, 1971. 15 p.

Descriptors: *Environmental effects, *Dam construction, *Multiple-purpose reservoirs, *Water supply, Flood protection, Multiple-purpose projects, Fish conservation, Oklahoma, Recreation, Administrative agencies, Wildlife conservation, Water conservation, Wildlife habitats, Non-structural alternatives, Flood control, Water resources development, Watershed management.
Identifiers: *Environmental Impact Statements, *Jackfork Creek (Okla), *Clayton Lake (Okla).

The project would consist of construction of a flood control, water supply, recreation, and fish and wildlife lake located in Pushmataha and Latimer Counties, Oklahoma. There will be a significant reduction in annual flood damages in the area downstream from the dam. Water supply will be provided for the immediate area and also for distant urban areas where water resources are inadequate. Maintenance of the conservation pool will inundate 14,360 acres including cropland, open pasture, and woodlands. This land also provides food and cover for wildlife. Development of a lake project with storage will result in a change of land use from low-production agricultural activities to public uses associated with an attractive body of water and its surrounding area. Alternatives to the proposed project include channel improvement, watershed treatment, upstream retention lakes, non-structural action, and 'no development'. (Waldron-Florida)

8B. Hydraulics

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DRAG REDUCTION DEGRADATION OF DILUTE POLYMER SOLUTIONS IN TURBULENT TUBE FLOW,
Notre Dame Univ., Ind. Coll. of Engineering.
N. D. Sylvester, and S. M. Kumor.
Available from NTIS, Springfield, Va. 22151 - AD734-676 \$3.00 paper copy; 95 cents microfiche.
Technical Report No THEMIS-UND-71-6, November 1971. 55 p, 15 fig, 4 tab, 77 ref, append. ONR Contract N00014-68-A-0152.

Descriptors: *Turbulent flow, *Flow friction, *Tubes, *Drag, *Polymers, Hydraulics, Model studies, Analytical techniques, Fluid mechanics, Dynamics, Flow resistance, Roughness (Hydraulic), Viscosity, Velocity, Flow rates, Mathematical studies.

A recycle tube flow experiment was used to investigate drag reduction characteristics of polymer solutions (Separan AP 30). Experimental pressure gradient and flow rate measurements were made as a function of time. From these data, friction factor-time plots on log-log coordinates were constructed, all of which exhibited three distinct regions: (1) at short times, a constant friction factor given by a maximum drag reduction equation; (2) a linear region in which the friction factor increases with time; and (3) at long times, an asymptotic nonlinear approach of the polymer solution friction factor toward the solvent friction factor. Correlations are presented relating the process time maximum drag reduction exists and the process time significant drag reduction exists for a solution under continuous turbulent flow and the real time significant drag reduction exists for a solution under continuous turbulent flow and the real time significant drag reduction exists for a solution under continuous turbulent flow, to viscosity, concentration, and velocity. (Woodard-USGS)

SEICHES OF SYDNEY HARBOR, N. S., Department of the Environment, Ottawa (Ontario). Marine Sciences Branch. For primary bibliographic entry see Field 02E. W72-11747. MOMENTUM TRANSFER FROM A JET TO A VORTEX,

VORTEX,
Universidad Nacional Autonoma de Mexico, Mexico City, Instituto de Ingenieria.
El edi

Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 1, Paris, France, p 127-134, Aug-Sept 1971. 4 fig, 2 ref.

Descriptors: *Momentum transfer, *Vortices, *Fluid mechanics, Rotational flow, Eddies, Laboratory tests, Cyclones, Tornadoes, Hydraulics, Flow, Momentum.

Identifiers: *Entrances (Fluid flow), Centripetal

Unlike wake vortices, drain and inlet vortices, cyclones, and tornadoes cannot be explained as being friction effects, but are a result of an unstable process, which starts when an accelerated or decelerated jet contacts a body of stagnant fluid. This hypothesis is corroborated as follows: A part of the jet momentum gives rise to the centripetal force working in the vortex; consequently, a specified dimensionless group, containing both jet and vortex characteristic parameters, must keep a constant value. The condition is verified by 3 different experimental vortices: (1) arising behind a rectangular orifice set across a laboratory channel; (2) produced in a tank by a jet issued from a vertical nozzle; or (3) produced in a tank by a jet issued from an oblique nozzle. (USBR) W72-11784

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 02E. W72-11866

TEMPERATURE EFFECTS IN LOW-TRAN-SPORT, FLAT-BED FLOWS, California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources. For primary bibliographic entry see Field 02J. W72-11986

EFFECTS OF INFLOW CONDITION ON HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical En-

gineering.
H. J. Leutheusser, and V. C. Kartha.
Lournal of the Hudraulics Division American

H. J. Leutneusser, and V. C. Kartna. Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9088, p 1367-1385, August 1972. 8 fig, 2 tab, 16 ref, append. NRCC Grant A-1541.

Descriptors: *Hydraulic jump, *Supercritical flow, Hydraulic models, Critical flow, Froude number, Transition flow, Turbulent flow, Boundary layers, Shear drag.

The jump phenomenon is affected by the condition of inflow of the supercritical stream. Based on an unconventional concept of longitudinal extent, the hydraulic jump in a horizontal, smooth-walled channel of rectangular cross section is studied both analytically and experimentally. Jumps with developed inflow are longer, lower, and subject to higher and more uniformly distributed skin friction than jumps with undeveloped inflow. Jumps with undeveloped inflow have shear distributions which reveal a tendency toward separation with increasing Froude number. The trend is verified by the observed behavior of jumps with undeveloped inflow at Froude number as large as 30. Semi-empirical, closed-form relationships between sequent depth ratio and Froude numbers are derived and checked against experimental evidence. (Knapp-USGS)

RESISTANCE COEFFICIENTS FOR STEADY SPATIALLY VARIED FLOW, Illinois Univ., Urbana. Dept. of Civil Engineering. B. C. Yen, H. G. Wenzel, Jr., and Y. N. Yoon. Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9107, p 1395-1410, August 1972. 3 fig. 3 tab., 7 ref, append. OWRR B-043-ILL (4) and B-018-ILL (5).

Descriptors: *Open channel flow, *Overland flow, *Flow resistance, Darcy-Weisbach equation, Rainfall-runoff relationships, Steady flow, Roughness (Hydraulic), Non-uniform flow. Identifiers: Spatially varied flow.

In spatially varied flow the three coefficients in Weisbach f form are the resistance coefficients. They are the frictional resistance coefficients. They are the frictional resistance coefficient, the dissipated energy coefficient, and the total head-loss coefficient. In general these three coefficients are not equal whether there is later flow or not. Only for steady uniform flow without lateral flow are these three coefficients equal to one another and to the corresponding f in the Moody diagram. Theoretical solution of steady two-dimensional Stokes flow with lateral flow is obtained to show the difference among these three coefficients. Experimental data for steady two-dimensional sheet flow under simulated rainfall were also analyzed to illustrate numerically the variations of these coefficients. In practice, hydraulic engineers should keep in mind the difference in these different resistance coefficients, to avoid unnecessary errors. (Knap-USGS) W72-12043

FLOW CHARACTERISTICS WITHIN A CHAN-NEL BOUNDARY OF COARSE MATERIALS, Mississippi State Univ., State College. Water Resources Research Inst.

naississippi State Univ., State College. Water Resources Research Inst. J. C. McWhorter, J. B. Allen, and Y. K. Tang. Available from the National Technical Information Service as PB-211 150, \$3.00 in paper copy, \$0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, July 1972, 22 p, 10 fig, 1 ref. OWRR A-057-MISS (1).

Descriptors: *Channel flow, *Boundaries (Surfaces), *Linings, *Flow characteristics, *Gravels, Boundary layers, Channel flow.

The effects of bed slope, relative thickness of a gravel layer, and relative size of gravel on a dimensionless velocity profile were determined. By study and comparison of the several profiles acquired, it was shown that the gravel layer was effective in shifting the zone of relatively high velocity gradient away from the absolute channel bottom. Also, an increase in relative size of gravel significantly increased the relative velocity within the gravel layer.

W72-12106

8C. Hydraulic Machinery

OPERATING EXPERIENCE WITH THE VAN-COUVER ISLAND PLUS OR MINUS 260-KV HVDC SUBMARINE LINK,

British Columbia Hydro and Power Authority, Vancouver.

W. Chin, A. H. Csepe, and D. L. McDonald. Proceedings, American Power Conference, Vol. 33, p. 1063-1072, 1971, 3 fig, 4 tab, 11 ref.

Descriptors: *Direct current, *Converters (Electrical), Electrical insulation, High voltage, Rectifiers, Transmission (Electrical), Electric power, Cathodes, Anodes, Performance, Flashover.

Identifiers: "Terminal facilities (Electrical), "Submarine cables, "Interconnected systems, Ground return, Power interchange, Canada, Vancouver (Canada), Cable terminations, Sea electrodes, Outages, Operating personnel.

Field 08—ENGINEERING WORKS

Group 8C—Hydraulic Machinery

The operational experience gained from the plus or minus 260-kv HVDC monopolar system, which began commercial operation in July 1968 between mainland Canada and Vancouver Island, is discussed. The system uses an earth return and operates in parallel with a previously installed 138tw a-c interconnection. The 45.7-mi-long d-c inter-connection consists of 20.2 mi of submarine cable and 25.2 mi of overhead line. Of three 280-kv, 600and 25.2 m of overhead met. Of three 250-ky, odamp, dc cables, one is a spare. Each of the 2 converter stations has 2 mercury-arc valve groups; each group consists of 6 main valves and a bypass. Each valve group is rated 130 ky, 1200 amp, 156 mw, resulting in a pole rating of 260 ky, 1200 amp, 312 mw. Except for an additional smoohing reaches the 50-state states because and a tor, two 50-mvar synchronous condensers, and a third harmonic a-c filter, the Vancouver Island Terminal equipment is identical to Arnott. Operating performance of the converter stations, the anode and cathode installations, and operating staff requirements are reviewed. (USBR) W72-11783

PNEUMATIC BARRIER AND BEACH POLLU-

AMF Technical Center, Stamford, Conn. For primary bibliographic entry see Field 05G. W72-12076

DEVICE FOR CONTROL AND PREVENTION

OF COAST EROSION,
Fyens Saekkekompagni A.S. (Denmark). (assignee).
E. Nielsen.

U. S. Patent No. 3,538,711, 3 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 413, November 10, 1970.

Descriptors: *Patents, *Shore protection, *Beach erosion, Coasts, Erosion, Waves (Water).

Perforated or pervious flexible tubes or hoses are laid out in lengths and filled selectively with sand and small stones without any binding agent. A flexible pumping hose is run into the tube, sealing the end of the tube which is laid first anchoring this end to the seabed, keeping the rest of the tube afloat and eventually sealing the tube when the filling has been completed. (Sinha-OEIS) W72-12156

CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Seattle, Wash.

Available from the National Technical Informa-tion Service as PB-199 458D, \$3.00 in paper copy, \$0.95 in microfiche. May 11, 1971. 11 p, 2 map, 1 dwg.

Descriptors: *Powerplants, *Columbia River, *Environmental effects, *Generators, *Fishkill, Grand Coulee Dam, Hydroelectric power, Supersaturation, Hydroelectric plants, Washington, Rocky Mountain Region, Nitrogen compounds, Tailwater, Administrative agencies, Riparian land, *Washington

*Washington.
Identifiers: *Environmental Impact Statements,
Bridgeport (Wash), *Chief Joseph Dam (Wash).

The proposed project would expand the power-house and generating capabilities of Chief Joseph Dam on the Columbia River near Bridgeport, Dam on the Columbia River near Bridgeport, Washington, and would increase the depth of the forelay by 10 feet. Installation of 11 additional generating units in spaces already provided would balance the project's hydraulic capacity with Grand Coulee Dam. This balance would minimize spillage of surplus water and reduce supersaturated nitrogen conditions, which now contribute to fish mortalities downstream. The project would result in more frequent fluctuations of tailwater. Installation of the additional generating units will enhance the long term environment by reducing

occurrence of supersaturated downstream nitrogen. The only alternative would be no action.
(Waldron-Florida) W72-12330

BIRON PROJECT NO. 2192 ON THE WISCON-SIN RIVER IN WOOD AND PORTAGE COUN-TIES, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Consolidated Water Power Co., Wisconsin

Available from the National Technical Informa-tion Service as PB-199 320D, \$3.00 in paper copy, \$0.95 in microfiche. December 31, 1971. 19 p, 3 ap-

Descriptors: *Environmental effects, *Wisconsin, Permits, *Turbines, *Electric powerplants, Hydroelectric plants, Hydroelectric power, Administrative agencies, Project benefitis, Flood control, Recreation, Fish management, Electric power, Wildlife conservation, Federal government, State governments, River regulation, Reser-

voir operation.

Identifiers: *Environmental Impact Statements,
*Wisconsin Rapids (Wis).

Consolidated Water Power Company has applied for a new license for the hydroelectric project located on the Wisconsin River near the city of Wisconsin Rapids. The project's reservoir sup-Wisconsin Rapids. The project's reservoir sup-plies water to turbines located at the mill of Con-solidated Papers, Inc. Continued operation of the project under a new license would have a minimal impact on the environment since this is a fully developed, run-of-the river project, operated in conjunction with other reservoirs and powerplants to provide maximum flood control, recreation, fish, and wildlife conservation. The project, based on actual experience since 1854, would continue to furnish simificant benefits to the long-term furnish significant benefits to the long-term productivity of the area. There are no known adverse environmental effects that would be cause by the continued operation of the project. The only alternatives to the proposed plan would call for either a takeover by the federal government or removal of the project's facilities and return of the river to its natural state. The continued operation of the project under license would involve no irreversible or irretrievable commitment of resources. (Waldron-Florida) W72-12333

BEAVER DRAINAGE DISTRICT, OREGON--PROPOSED IMPROVEMENTS, FLOOD PRO-TECTION (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).

Army Engineer District, Portland, Oreg

Available from the National Technical Informa-tion Service as PB-200 793D, \$3.00 in paper copy, \$0.95 in microfiche. June 25, 1971. 19 p, 1 map.

Descriptors: *Pumping plants, *Flood protection, *Levees, *Environmental effects, Discharge lines, Drains, Hydraulics, Fish conservation, Aquatic environment, Wildlife conservation, Land use, Engineering structures, Project planning, Drainage systems, Specific capacity, Land management, *Oregon.

Identifiers: *Environmental Impact Statements, *Columbia County (Ore).

The project would involve the construction of a new pumping station of increased capacity, relocating the discharge lines of a second existing pumping station, constructing a new tide box with pumping station, constructing a new due took with a positive closure gate-well structure, and raising and reinforcing the existing main levee and in-stalling toe drains as required. The project located in Columbia County, Oregon. The project will increase the food protection capabilities of the existing protective works and increase effectual land use within the area. Construction activities will temporarily disbcate some fish and smaller species of wildlife. An estimated 25 acres of land required for project right-of-way will be restricted in use to prevent a reduction in effectiveness of the levee. Alternatives to the project are minor changes in the layout or design of drainage and pumping facilities or no action at all. Planning of the authorized project is being accomplished in coordination with interested federal and state agencies. (Waldron-Florida)

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AN AUTOMATED SURFACE IRRIGATION

AN AUTOMATED SOLUTION.

AN AUTOMATED SOLUTION.

Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Murphy (Frank W.) Manufacturers, Tulsa, Okla.

P. E. Fischbach, and R. Goodding, II.

Agricultural Engineering, Vol. 51, No. 11, p 584-585, November 1971. 5 fig.

Descriptors: *Irrigation systems, *Irrigation en-gineering, *Automatic control. Identifiers: *Surface irrigation valves.

If any part of an individual surface irrigation system fails, it appears best that all valves auto-matically open to let the water flow down all fur-rows of the fields involved until repairs can be made. Electric controls for automated surface irrigation systems with a reuse system have been developed. In the irrigation controller a time clock, relays, time-delay relays and stepping relays control small 3-way solenoid valves that control the air to the automatic valves. The automated valve connects to a riser on a buried pipeline or a tee in a supply line. Gated pipe is connected to the valve to distributed water down the furrows. The dimensions and placement of the valve assembly are described and diagrammed. Field tests in whi valves were satisfactorily used are described. (Casey-Arizona) W72-12355

8D. Soil Mechanics

USING SOIL MECHANICS IN OCEAN EN-GINEERING, Dames and Moore, Los Angeles, Calif. For primary bibliographic entry see Field 08A. W72-11791

UPLIFT RESISTANCE OF ANCHOR BAR, PRESSED PLATE, AND SCREW ANCHOR FOOTINGS IN SILTY SAND,

Bureau of Reclamation, Denver, Colo. J. M. Horner.

Bureau of Reclamation Report REC-ERC-71-40, Oct. 1971. 41 p, 43 fig, 2 tab, 9 ref, append.

Descriptors: *Foundations, *Loads (Forces), *Movement, On-site investigations, Transmission towers, Dune sands, Soil properties, Lateral forces, Soil mechanics, Soil tests, Soil strength,

Shear strength, Transmission lines, Earth pressure, Foundation investigations. Identifiers: *Pull-out tests, *Uplift resistance, Anchored footings, Fort Thompson-Grand Isld Trans Line, Screw anchor footings, Pressed plate feetings.

The Bureau of Reclamation tested 17 full-size transmission tower footings in dune sand. An uplift load was applied to each footing and vertical and horizontal movements and rotations were measured. The footing types tested were: (1) anchor bar-a concrete cap connected to 4 reinforced grout columns, (2) pressed plate-a steel plate and stem placed in compacted soil, and (3) screw anchor-a concrete cap connected to 3 or 4 steel screw anchors. Generally, screw anchor footings were the most resistant to movement under load, followed by the pressed plate, and

Research Facilities - Group 9C

then the anchor bar. Three individual vertical anchor bar columns also were tested. Analyses indicated these columns resisted more than 3 times the predicted uplift loads. The results appear to indicate that lateral pressures in the dune sand in-creased considerably as the columns moved through the soil. Further research is needed to ac-curately predict the movement of footings under uplift loads. (USBR) W72-11793

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MUDDY CREEK RESERVOIR, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Informa-tion Service as PB-202 903D, \$3.00 in paper copy, \$0.95 in microfiche. November 16, 1970. 19 p, 3 illus, 5 tab, append.

Descriptors: *Flood control, *Environmental effects, *Earth dams, *Reservoir operation, Natural streams, Land development, Project benefits, Turbidity, *Pennsylvania, Dam construction, Recreation, Project planning, Land use, Silting, Productivity. Productivity.
Identifiers: *Environmental Impact Statements,

*Teepleville (Penn).

This dry-bed reservoir project would require construction of a rolled earth embankment dam located near Teepleville, Pennsylvania. This detention type dam represents completion of the coordinated French Creek Basin reservoir. The project would permit full realization of designed flood protection of three reservoir systems. Project construction would result in the loss of a small portion of existing stream at dam site and 1,210 acres of land would be subject to periodic inundation. There will be a temporary increase in stream turbidity and siltation during construction. The increased flood protection could encourage in-creased agricultural usage and reduce lands availa-ble for wildlife protection. Long-term productivity will be served by providing outdoor recreation op-portunity for public use. Alternatives considered include construction of a large multiple purpose reservoir and no action. (Waldron-Florida) W72-12340

BEAVER DRAINAGE DISTRICT, OREGON--PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).

Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08C.

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Portland, Oreg.

Available from the National Information Service as PB-200 792D, \$3.00 in paper copy, \$0.95 in microfiche. April 9, 1971. 25 p, 2 map.

Descriptors: *Environmental effects, *Dam construction, *Multiple-purpose projects, *Flood control, Erosion control, Rockfill dams, Natural streams, Rock mechanics, Reservoirs, Rural areas, *Oregon, *California, Recreation, Irrigation practices, Crop production, Land use, Administra-

Identifiers: *Environmental Impact Statements, *Applegate River, Oregon.

This project calls for construction of a multiple-purpose dam and lake project in Jackson County, Oregon, and Siskiyou County, California. The plan of improvement provides for a rockfill em-bankment dam and will result in the substitution of a dam and lake for about five miles of free-flowing river and adjacent valley floor. The project will, by serving flood control and irrigation needs, pro-vide for an early increase in future agricultural productivity. There will be a change of some sur-rounding project lands from remote and unspoiled areas to intensive recreational activity. The pro-ject will reduce downstream floods, debris accumulation and loss of topsoil. Alternatives to the project are dam construction at other sites or no action. (Waldron-Florida) W72-12342

8E. Rock Mechanics and Geology

AZOTEA TUNNEL INSTRUMENTATION PRO-GRAM, SAN JUAN-CHAMA PROJECT, NEW MEXICO,

Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 08A. W72-11787

8G. Materials

A SURVEY OF THE PRINCIPLES OF METAL-LIC CORROSION AND ITS CONTROL IN SALINE WATERS,
Commonwealth Scientific and Industrial Research

Organization, Garden City (Australia). Div. of Mineral Chemistry. For primary bibliographic entry see Field 03C. W72-11759

81. Fisheries Engineering

BIOLOGICAL BASIS FOR THE COMMERCIAL SIZE OF THE SEA TROUT SALMO TRUTTA MORPHA LACUSTRIS OF THE GREAT LAKES OF NORTHERN KARELIA,

OF NORTHERN KARELIA,
D. K. Khalturin.
Vopr Ikhtiol, Vol 11, No 3, p 464-470, 1971.
Identifiers: *Fish management, *Commercial fish,
Biology, Karelia, Lakes, Legislation, Salmo trutta
morpha lacustris, Size, Trout, USSR, Fish
stocking.

During the past decade catches of S. trutta morpha lacustris in the Karelian lakes forming the basin of lacustrs in the Aaretan nasks forming ine dash of the White Sea have been rapidly decreasing. This has been largely due to irrational management of the lakes and lack of adequate guidance in fish breeding. The White Sea Biological Station of the Karelian Branch of the Academy of Science of the USSR had made a series of recommendations to the Supreme Soviet of the Karelian ASSR for rigidly enforced laws governing fish size and limits on catches, and management of the fish industry in order to alleviate the situation.—Copyright 1972, Biological Abstracts, Inc.

CHANGES IN BLOOD LACTIC ACID CONCEN-CHANGES IN BLOOD LACTIC ACLD CUNCENTRATIONS IN ALEWIVES (ALOSA PSEU-DOHARENGUS) DURING PASSAGE THROUGH A POOL AND WEIR FISHWAY, Fisheries Research Board of Canada, Halifax

(Nova Scotia).

J Fish Res Bd Can. Vol 28, No 8, p 1215-1217. 1971. Illus.

1971. Illus. Identifiers: *Alewives, Alosa-Pseudoharengus, *Blood, Fishway, *Lactic-Acid, Passage, Pool,

Blood lactic acid concentration of anadromous A. Blood lactic acid concentration or anauromous Apseudoharengus sampled during their upstream migration through a pool and weir fishway was not extremely high (46.7 mg/100 ml) and the degree of exercise exhibited during ascent was judged to be moderate. For fish that were subjected experimentally to severe exercise, the concentration (108.7 mg/100 ml) was more than 5 times that for rested fish (18.9 mg/100 ml). Of the 3 groups of fish sampled directly from the fishway pools, only I had an average concentration that differed significantly from that for the rested state.—Copyright 1972, Biological Abstracts, Inc. W72-12252

TULATIN PROJECT, OREGON (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12331

CAMERON-CREOLE WATERSHED, LOUI-SIANA (FINAL ENVIRONMENTAL IMPACT

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 08A. W72-12334

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

AN INDEPENDENT STUDY COURSE IN

WATER RESOURCES, Southern Illinois Univ., Carbondale. Dept. of Conservation and Outdoor Education. P. F. Nowak

Journal of Environmental Education, Vol. 1, No. 3. Spring 1970, 2 p.

Descriptors: *Education, *Water resources, *Social aspects, *Training, Environment.

The adult segment of the American population has had little environmental education and it is resultingly ill-equipped to confront the environmental problems of the day. Even youth are receiving only a haphazard smattering of educational experiences dealing with environmental is-sues. Dr. W.B. Stapp of the University of Michigan formed a group to develop an independent correspondence course in environmental conservation. A water resources course was created as an experimental segment of this total program in order to evaluate the innovated concepts upon which the course was based. The course materials consisted of a text and a series of activities which were designed to integrally provide a total environmental picture to the student. A set of course evaluation materials are described which provided a picture of the students and their educational ins in the course. The students, who were evenly split between male and female and had an average age of 38.3 years, showed a 44.6% increase in their general knowledge of water resources and a 35% increase in their knowledge of local community water resources. It seems evident that environmental education programs for adults are needed and wanted. (Casey-Arizona) W72-12350

9C. Research Facilities

EXPANSION OF THE ALASKA WATER LABORATORY, Congress, Washington, D.C.; and House,

Washington, D.C. For primary bibliographic entry see Field 06E.

W72-12303

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10C - Secondary Publication and Distribution

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication AND Distribution

BIBLIOGRAPHY OF SALINE WATER CON-VERSION LITERATURE, Rocketdyne, Canoga Park, Calif. For primary bibliographic entry see Field 03A. W72-12044

LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center. For primary bibliographic entry see Field 05G. W72-12297

10F. Preparation of Reviews

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY, National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. For primary bibliographic entry see Field 05A. W72-11797

MERCURY IN THE ENVIRONMENT. A TOX-ICOLOGICAL AND EPIDEMIOLOGICAL AP-PRAISAL, Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 05C. W72-11842

THE PESTICIDE MANUFACTURING INDUSTRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES,
Texas Univ., Austin. Dept. of Civil Engineering. For primary bibliographic entry see Field 05D. W72-12009

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC NORTHWEST RELATING TO POSSIBLE POLLUTION.

Oregon State Univ., Corvallis. Dept. of Oceanography.

For primary bibliographic entry see Field 05B.

W72-12190

GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH, Fuhriman, Barton and Associates, Provo, Utah. For primary bibliographic entry see Field 05B. W72-12193

STRUCTURE OF WATER, For primary bibliographic entry see Field 01A. W72-12372

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tion by Marine Organisms,	W72-12011 5D	
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.

- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

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- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT
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